ATARATIRI

DRAFT ENVIRONMENTAL EVALUATION STUDY REPORT

William Clarkin,
Acting Commissioner,
City of Toronto
Housing Department,
September 1991

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This report represents the efforts of many companies retained by the City of Toronto to identify key environmental concerns off and on the Ataratiri site and to propose cleanup methods and strategies. The companies and the aspects of the work program to which each contributed include (in alphabetical order):

Angus Environmental Limited	Project Coordination
CanTox Inc.	Human Health Risks Issues
Concord Environmental	Transportation and Fixed Facilities Risks
M.M. Dillon Ltd.	Soil and Groundwater Quality
Golder Associates	Soil and Groundwater Quality
Marshall Macklin Monaghan Limited	Flood Risk Management Storm Water Management
MacLarentech Inc.	Soil and Groundwater Quality Collection of Atmospheric Emission Data
The Proctor & Redfern Group	Soil and Groundwater Quality
R.C. Sims and Associates	Soil and Groundwater Technology Screening
Rowan Williams Davies & Irwin Inc.	Air Quality
SENES Consultants Limited	Overall Project Management
Trow, Dames & Moore	Soil, Groundwater, and Storm Water Quality
Vibron Limited	Noise and Vibration
Wallace Associates	Public Participation

PREFACE

The Ataratiri Environmental Evaluation Study report has been prepared in partial fulfilment of an Exemption Order granted under Section 29 of the Ontario Environmental Assessment Act by the Minister of the Environment to the Corporation of the City of Toronto on 13 July 1988 concerning the redevelopment of the Ataratiri site (formerly known as St. Lawrence Square).

It is the intention of the City to redevelop the site into a community for 12,000 to 14,000 people. This community will offer a mix of housing types, community and social services to meet the needs of its residents, and a stable base of employment opportunities for at least 1,500 people. A primary objective of the development is to increase the supply of non-profit and affordable housing in the City of Toronto.

One of the principal conditions of the Exemption Order is that "an environmental overview study shall be undertaken by the proponent and submitted to the Minister of the Environment for approval following an opportunity for public notice, review and comment, before the Official Plan amendment(s) for the undertaking is submitted to the Minister of Municipal Affairs for approval under the Planning Act". The Ataratiri Environmental Evaluation Study has been undertaken to fulfill this condition. The following report describes the results of six background environmental studies and the public consultation process that have been carried out as part of the Environmental Evaluation Study. It also describes the environmental planning and approval process that will be proposed in the Part II Official Plan amendment for Ataratiri, and makes recommendations for further studies.

An earlier draft of this document was distributed for review and comment to City departments, regulatory agencies, and members of the Ataratiri Neighbourhood Advisory Council. This revised draft, which responds to the earlier comments, is being made available for public review and comment. In reviewing this revised draft, members of the Neighbourhood Advisory Council expressed their wish to invite public comments on the report. The final Environmental Evaluation Study report will be submitted to City Council and the Minister of the Environment for approval before the Official Plan amendment for Ataratiri is submitted to the Minister of Municipal Affairs for approval.

For further information, please contact:

Jane Weninger
Ataratiri Environmental Coordinator
City of Toronto Housing Department
20 Adelaide Street East
Toronto, Ontario M5C 2T6
Tel. (416)392-0062 Fax. (416)392-0560

The goals developed by the Environmental Subcommittee of the Neighbourhood Advisory Council have guided the preparation of this report.

1. To ensure that the site becomes and remains a safe and healthy place to live and work.
2. To evaluate existing environmental conditions at the site including any human health concerns, soil quality, surface and ground water quality, air quality (including dust and odours), and noise and vibration, and to evaluate the risk of flooding from the Don River and the risk of accidents on major road and rail corridors.
3. To make soil quality at the site safe for the intended land use and ensure that contaminated soils are disposed of appropriately.
4. To ensure that remediation of existing soil and ground water does not result in adverse human health or environmental impacts on or off the site.
5. To ensure that air quality at the site does not adversely affect the health of residents of the new community.
6. To ensure that measures are taken to protect occupants from unacceptable levels of dust, odours, and noise and vibration.
7. To ensure that residents of the new community are not subject to unacceptable levels of risk from flooding in the Don River or from accidents on road or rail corridors.
8. To document the environmental remediation process for the development so that future residents can verify that appropriate steps were taken to remediate any human health and safety concerns at the site.
9. To implement a planning and development strategy that is consistent with the goal of restoring the Don River to a more natural state.
10. To incorporate state-of-the-art waste reduction and recyclable material recovery systems into site planning and building design.
11. Where hard services (e.g., sewers) are to be replaced, to replace them with the most environmentally sound alternatives.

REPORT SUMMARY

The Development

Ataratiri came into being in July 1988 to deal with the severe shortage of affordable housing in the City of Toronto. It is a joint proposal of the City and the Province to change an 80-acre (32-hectare), under-used, declining industrial area into an exciting new community of 7,000 homes for 14,000 people. The site is located to the east of the downtown, stretching east from Parliament Street almost to the Don River, and south from Front Street East, Eastern Avenue and Front Street East to the rail corridor. Ataratiri is one of the largest and most ambitious redevelopments being undertaken by any city in North America.

Toronto has a proven ability to create new communities which are vital, dynamic and successful, such as the St. Lawrence and Frankel-Lambert Neighbourhoods. Ataratiri will set the standard for future developments.

The Benefits of Ataratiri

Ataratiri will benefit the residents of Toronto because it will:

- add to the stock of affordable housing, including social housing
- clean up a polluted area
- help improve the Don River Valley
- eliminate existing storm sewers that flow directly into the Don River
- provide flood protection for 403 acres (290 hectares) of downtown Toronto, including the St. Lawrence Neighbourhood
- create jobs in the construction industry and building trades, work in industries such as furniture and appliance manufacturing, and for architects and engineers, totalling an estimated 15,000 person years
- create approximately 2,100 permanent jobs on the site
- create a new neighbourhood without using up valuable farm land
- cut pollution by encouraging walking, and the use of bicycles and mass transit rather than cars
- demonstrate new ways to provide social services such as health and recreation services
- help give artists both housing and workspace that they can afford

The Environmental Challenge

From the start, it was known that there would be many environmental concerns, including a risk of flooding because the site is bounded on the east side by the Don River. The Province's Exemption Order, exempting Ataratiri from the Environmental Assessment Act, outlined 11 tough conditions. These included the need for specific technical studies of environmental conditions at the site, leading to recommended clean-up methods where needed. The only thing that the Exemption Order released the City from was the requirement to look at other sites for development. This Environmental Evaluation Study Report (EES) is the comprehensive study which includes the information from the specific studies.

After the comments received during the 30-day public review of this draft of the report are included in a new draft there will be another 15-day public review period before it goes to City Council and the Minister of the Environment for final approval. There will be announcements in the newspapers about the dates for this second review period.

What's In This Report

The preparation of this report was guided from the beginning by the Ataratiri Neighbourhood Advisory Council, a 19-member group, representative of the people who will be living and working in Ataratiri. They set up a special subcommittee on the environment and its goals are listed on the back of the preface page of the report.

This report contains the results of specific environmental studies: air quality, noise and vibration, soil quality, groundwater and storm water quality, flood risk and risks from transportation routes and fixed facilities.

A description of how the citizens of Toronto took part in discussions leading to this report is also included, as is an outline of the environmental and planning approvals process for Ataratiri.

The preparation of all of these reports has been a challenge as the City is a pioneer in developing a site of this size, and answers are being developed for situations not faced before.

THE STUDIES

Air Quality

Air quality was examined by collecting information on emissions from nearby industries, studying data from air monitoring programs, predicting the impact of traffic and using computers to model future conditions.

When the site is developed, air quality in Ataratiri is expected to be similar to that in other downtown residential areas such as the St. Lawrence Neighbourhood. There may be some conditions which will cause irritation to people with breathing difficulties. Unpleasant smells might be noticeable from time to time. This is not unusual in cities. However, most of these will disappear as many of the places from which they come will be closed or increasingly controlled. A rendering plant, south of the site, not slated for redevelopment was bought as part of the land assembly, to rid the area of a source of odours.

The quality of air in Ataratiri is also affected by activities outside of its boundaries. Cutting back on the use of cars, increasing the use of public transit and planting trees will benefit Ataratiri and the city as a whole. Improved connections to public transit and bicycle routes are planned for Ataratiri. To ensure that a record is kept on the air quality on the site, and neighbouring parts of eastern Toronto, a recommendation is being made that the Ministry of the Environment set up an air monitoring station nearby.

Noise and Vibration

Current noise levels in Ataratiri are higher than they should be for a residential area, but, most existing on-site sources of noise will be eliminated during redevelopment. The main sources of off-site noise are the roads and railway lines at the eastern and southern sides of the site. These off-site noises are expected to increase by the year 2010 but careful planning such as setting housing, schools, and day care centres back from major roads and railways; and having outdoor living spaces and common courtyards protected from noise by buildings will lessen the effects on residents.

Rail and street car traffic are the main sources of vibration. Buildings at the southern and eastern ends of Ataratiri, closest to the railroad tracks, will be set back at least 30 metres to avoid vibration impacts.

Soil Quality

The industries that have operated on the site over the past 100 years, and the placement of mildly contaminated land fill, have resulted in pollution of the soil. Samples of soil have been taken from more than 250 places on the site, many from several different depths. More than 700 samples have been tested for the presence of metals and organic compounds such as polychlorinated biphenyls (PCBs). In addition, samples have been taken from the bedrock in several locations.

The test results show that about half of the site currently does not meet guidelines for housing sites or for industrial or commercial use. For example, higher than acceptable quantities of various metals were frequently found where scrap yards had been located. Also, higher than acceptable levels of coal tar are found in several areas. They are highest in the western part of the site where a coal gasification plant operated until the 1950s. Higher than acceptable levels of polychlorinated biphenyls (PCBs) are found in only a few areas, often at scrap yards. Most of the original soil that lies under the fill meets guidelines, except near the former coal gasification plant.

To find the best ways to clean the soil, 21 methods were studied. These have been reduced to nine that will be suitable for Ataratiri. The final clean-up plan will involve some of these methods being used singly or in combination. Much original work was done in developing the process to find specific methods of clean-up for specific areas of the site.

It is understood that soil clean-up will have to be carried out in coordination with groundwater clean-up and, in some areas of the site, in coordination with flood protection work.

Maximum costs, in 1991 dollars, for the clean up of soil and groundwater are estimated at $160 million.

Groundwater and Storm Water Quality

Groundwater at Ataratiri is not a direct source of drinking water, but its quality is important, as it discharges into the Don River and into Lake Ontario.

Soil pollution on the site can affect groundwater and storm water quality. Groundwater samples have been collected from approximately 90 places on the site, and information gathered about the make-up of this water and how fast and where it moves. In addition, water samples were collected from two places in the sewer system during a storm.

The investigations of groundwater show that the site, except for the one block where the gasification plant was located, a block in the south-east corner, and a few isolated areas where it is suspected that underground storage tanks have leaked, is not a source of groundwater contamination by metals or other inorganic compounds. Although organic pollutants in several areas do need clean-up there is no evidence of contaminated groundwater going into the sewers.

To clean up the pollutants that were found in the groundwater, 18 possible methods were studied. This number has been narrowed to 10 that will be suitable for the site. Storm water quality on the site will improve as redevelopment changes the use of the land. Storm water, which now runs overland to the river or the lake, will be treated in a holding tank before it is released into Lake Ontario.

During excavations at Ataratiri, water will have to be removed. Most of this can go into the sanitary sewers once the solids have been taken out. The groundwater coming from the excavations will be checked periodically as required by the Toronto Sewer Use By-Law.

In any soil and groundwater clean-up plans, possible health risks to future residents and workers, clean-up workers and those living or working near the site must be considered. In each case, the possible risk depends upon how such individuals will come into contact with pollutants, in what quantities and for how long.

The ways people can be exposed include: inhalation of airborne dust particles and vapours, direct ingestion of soil or dust (particularly by children) and by skin contact.

Clean-up workers' exposure will likely be higher than others, but for a shorter time. Various methods are available for reducing or eliminating worker exposures. These include using protective equipment, carefully monitoring concentrations of contaminants, worker education and training, and having a safety officer on-site to ensure that proper precautions are being taken.

The possible exposure of neighbours to pollutants would be for a short time and could be lessened by doing such things as keeping excavation surfaces damp to reduce dust, covering truck boxes with tarpaulins and washing the tires of trucks as they leave the site. The risks of exposures for neighbours will be taken into account as part of the plan for each clean-up method used.

Full-time residents and those using the site on a daily basis, even though they live elsewhere (such as children attending school on the site), will have the highest exposure over the longest periods of time to possible contaminants. These groups will be protected through the clean-up measures being recommended.

Thought has also been given to activities such as gardening. Gardening in Ataratiri will take place in areas covered by new topsoil brought from off the site and specific areas for gardening will be located in the courtyards of buildings, where they will be separated from the underlying soil by underground parking garages. This would prevent plants from absorbing any contaminants from the soil, and well planned exhaust systems will prevent any contaminants from spreading from the garages.

It is difficult to estimate the extent of health risks from soil as clean-up guidelines have not yet been decided for all the pollutants, and specific clean-up methods have not been decided upon. However, a method to predict potential health risks has been developed and is ready to be used when needed.

Flood Protection

Nearly all of Ataratiri is located in the Don River flood plain. Preventative measures are required to protect the area from possible flooding. These measures will also protect downtown as far to the west as Bay and Front Streets, including the St. Lawrence Neighbourhood. Measures are also being recommended to protect the area to the east of the Don.

All flood protection planning is being done within a Special Policy Area designation, granted in principle, under provincial Flood Plain Planning Policy.

Based on the results from work with computer models, a flood protection plan has been drawn up which includes: the placing of fill, widening the openings under four bridges and building a floodway. These measures would protect Ataratiri completely from the type of flooding which happens during a Regional Storm, such as Hurricane Hazel in 1954. Ultimately, it is possible to protect Ataratiri and its neighbours completely from Regional Storm flows as part of an overall master plan for the lower Don Valley flood plain.

Costs, in 1991 dollars, for the basic package of floodproofing measures are estimated at $20 million.

Transportation and Fixed Facility Risk

The transportation, handling and storage of hazardous materials in and around Ataratiri are a source of risk to future residents. Based on various types of information, including inventories of hazardous materials handled in the general area, Fire Department records, and estimates of transportation accidents involving hazardous goods, risks to future residents have been estimated for various events. The southeast corner of the site is at the highest risk because it is close to both the railways and roads. The risk from the railways is about the same as the average in other areas of Toronto. The risks from some sections of the roadways are higher than from the rail lines, but, less than those in nearby neighbourhoods. The port facilities are unlikely to pose any significant threat to Ataratiri. Existing storage facilities in Ataratiri that may contain dangerous goods will be removed as part of the redevelopment. To reduce risks from either transportation routes or fixed facilities, it is recommended that other routes be found in nearby industrial areas, buildings be set back an adequate distance from all transportation routes and fixed facilities, some of the sources of risk be removed, and emergency response plans be developed.

Public Participation

Many Torontonians have taken advantage of opportunities to learn about and comment on the environmental studies described in this report. These opportunities have included the ongoing involvement of the Ataratiri Neighbourhood Advisory Council. Public meetings, newsletters and the placing of written materials in public libraries for easy access have all been used to keep the public informed of progress and to get feedback.

More opportunities for public involvement include the funding of non-profit groups to review this report, several open houses and public meetings. Public comments received concerning this draft report, and responses to them, will be included in the final report that will go to City Council and then the Minister of the Environment for approval.

The Approvals Process

Environmental, land use and flood protection plans all need approval before development can start at Ataratiri. These three approval streams are all being addressed now and will come together in the Part II Official Plan amendment for the site. The Official Plan amendment and Rezoning By-Law will be submitted to the Ministry of Municipal Affairs for approval after the final EES report is submitted to the Minister of the Environment for approval. The amendment will include City Council's planning policies for Ataratiri, and propose a framework for getting development started.

Approvals for Ataratiri are expected to be given in the second half of 1992, when clean-up and flood protection work will begin. Construction on the first block in the west part of the site, will begin in the spring of 1993, with the first housing ready for occupancy in early 1994.

The rigorous environmental process that has been followed will ensure that Ataratiri is a safe, enjoyable neighbourhood in which a broad cross-section of Torontonians can live, work, learn and play.

CONCLUSIONS AND RECOMMENDATIONS

The preparation of the Environmental Evaluation Study (EES) report and its review by the public are being carried out to fulfill Condition 2 of the Exemption Order that was issued for Ataratiri. The Environmental Evaluation Study report describes the results of six background environmental studies that examine environmental conditions on and near the site and identify key environmental, health, and safety concerns associated with redeveloping the site. The report also describes the public participation that has been carried out to date, the ways that environmental conditions have been taken into consideration in the site planning process, and the planning and approvals process that will be followed in developing each area of the site and the types of agreements that will be entered into by the City.

An earlier draft of this report was reviewed by the Ataratiri Neighbourhood Advisory Council, civic officials and provincial agencies. This revised draft, which responds to their comments, is being released for public review. It will be revised to incorporate public comments before it is submitted to City Council and the Minister of the Environment for approval.

The main conclusions of Environmental Evaluation Study are outlined below. The conclusions are followed by recommendations for additional studies and actions to ensure that environmental, health and safety issues are given adequate consideration in the planning of Ataratiri, and to meet the requirements of the Ataratiri Exemption Order. Overall, the site in its current state has excessive noise levels, extensive soil and groundwater contamination, and the risk of flooding from the Don River. However, as this report demonstrates, the site can be made suitable for residential use. Ways of eliminating the environmental problems, the major costs, and the level of effort required are identified in the report.

The redevelopment of Ataratiri is a important undertaking for the City and the Province that will compliment other important initiatives that are underway. From the perspective of incorporating environmental considerations into the redevelopment process, Ataratiri will become a yardstick against which other large-scale redevelopments in the Metro area will be judged. It also represents an opportunity to reclaim a degraded part of the City, improve the environmental quality of surrounding neighbourhoods, and create a healthy and environmentally friendly community.

AIR QUALITY

CONCLUSIONS

Future air quality at the Ataratiri site was examined by using computer models to predict the impact of emissions from industries and traffic, and by studying data from nearby monitoring stations and odour complaint records. The results of these investigations indicate that four aspects of air quality are likely to be of occasional concern at Ataratiri: total suspended particulates (TSP), nitrogen dioxide (NO_{2}), ozone and odours. Very little information on toxics in the air is available, but, measurements of air toxics near sources of emissions in the vicinity of Ataratiri did not exceed guidelines.

The concentrations of the suspended dust particles themselves, or lead attached to the particles, measured at air quality stations near Ataratiri are not expected to cause any health concerns. No information is available for other substances that may be attached to suspended particles, but, any health related concerns are not expected to be different for Ataratiri than urban areas in general.

Individuals with respiratory disorders such as asthma and bronchitis may experience respiratory irritation, coughing and congestion if the highest nitrogen dioxide levels predicted for Ataratiri are correct. The guideline for nitrogen dioxide has rarely been exceeded at monitoring stations in the vicinity of Ataratiri and across the Province.

No long-term health problems are expected from ozone levels measured in the vicinity of Ataratiri. Ozone is a regional problem and the levels measured near Ataratiri are no worse than other areas of southern Ontario.

The redevelopment of Ataratiri and the closure of many nearby odour producing industries will reduce but may not totally eliminate complaints about odours at Ataratiri and in the surrounding neighbourhood.

Future air quality in Ataratiri is expected to be similar to that of nearby residential neighbourhoods. Air quality in the Ataratiri area is expected to improve as a result of increased regulation of industrial and vehicular emissions, the removal of existing industrial sources of emissions, and actions by local governments such as automobile minimization and planting of trees.

RECOMMENDATION 1

That the Ministry of the Environment be requested to establish an air quality monitoring station to serve the residents of east Toronto, including Ataratiri. If a monitoring station

is established, it should include analysis of total suspended particulates for organic and inorganic compounds in addition to parameters such as nitrogen oxides, nitrogen dioxide, ozone and sulphur dioxide.

EXPLANATION

Future air quality at Ataratiri is expected to be similar to that of nearby residential neighbourhoods. However, there are no continuous ambient monitoring stations in eastern Toronto. Because of nearby industrial and transportation emissions which have the potential to adversely affect east Toronto neighbourhoods, it would be desirable to establish a monitoring station in this part of the city. The Ministry of the Environment's mandate includes responsibility for monitoring air quality.

Information on the organic and inorganic constituents of TSP is not normally collected in air quality monitoring programs. Such data is needed to interpret information on TSP from a human health point of view.

RECOMMENDATION 2

That air quality monitoring be carried out during excavation and clean-up activities.

EXPLANATION

Monitoring for particulates and other compounds of concern should be carried out during soil clean-up to ensure that concentrations are kept within provincial guidelines and to protect remediation workers and surrounding communities.

RECOMMENDATION 3

That additional numerical computer modelling be carried out for buildings located on the northern border of the site between Parliament and St. Lawrence Streets and for buildings located on the southern and eastern borders of the site. The results will be used to determine the most suitable locations for air intakes to minimize the infiltration of emissions from traffic and toxic gases associated with accidents involving dangerous goods on the rail corridor. If numerical modelling can not define potential air quality concerns, short term monitoring or physical modelling should be carried out in these areas.

EXPLANATION

Numerical modelling has identified the northern border of the site between Parliament and St. Lawrence Streets as an area with potential air quality problems. The southern and eastern edges of the site are considered to be another area of potential concern because of their proximity to the rail corridors. The purpose of the modelling will be to further characterize air quality problems associated with local traffic and possible accidents involving dangerous goods on rail corridors and assist in locating and designing building air intakes.

RECOMMENDATION 4

That appropriate trees and shrubs be planted along the southern and eastern portions of the Ataratiri site to help reduce particulates from road and rail corridors from moving onto the site.

EXPLANATION

TSP has the potential to exceed air quality guidelines on the redeveloped Ataratiri site. Many of the sources of TSP are associated with common urban activities that can not be eliminated through the redevelopment of Ataratiri. Local actions such as the planting of vegetation, especially coniferous bushes and low trees, which acts to filter particulate matter from the air, will assist in reducing local TSP levels.

RECOMMENDATION 5

That future residents of buildings which the City owns or has control over be advised that odours associated with nearby industries could be experienced in Ataratiri.

EXPLANATION

Many of the possible sources of odour that have been a concern in and near Ataratiri in the past will have been eliminated before future residents move on to the Ataratiri site. However, some industries in the vicinity of Ataratiri may continue to produce unpleasant odours. Condition 5 c) of the Exemption Order requires that the City advise the residents of any buildings it controls of any ongoing concerns associated with environmental conditions at the Ataratiri site, including odours.

NOISE AND VIBRATION

CONCLUSIONS

Noise and vibration sources that have the potential to impact on Ataratiri were identified and characterized through monitoring and numerical computer modelling.

Current and future noise levels at the Ataratiri site are high enough to be of concern for residential uses but can be reduced to acceptable levels through careful site planning, architectural design and the use of barriers. The major off-site noise sources of concern are the Don Sorting Yards and the transportation corridors that pass through or close to the site.

Rail and street car traffic are the two major sources of vibration at Ataratiri. Current and future vibration levels are high enough to be of concern only on the south and east perimeter of the site. Minimum distance setbacks or vibration control measures will be required in these areas.

RECOMMENDATION 6

> **That detailed noise impact studies be carried out for each area of the site. These studies should consider the impact of on- and off-site road and rail traffic (including the Don Sorting Yards), any existing (e.g., nearby industry), and any approved stationary sources of sound on future site users. The studies should examine and recommend measures to reduce noise including architectural design and the use of barriers. The studies will identify those mitigation measures that should be carried out prior to the commencement of construction and those that should be carried out or completed after construction has commenced.**

RECOMMENDATION 7

> **That detailed Noise Impact Statements be prepared for each building at the building design stage and submitted to the Commissioner of Public Works and the Environment for approval, and that the buildings be designed, constructed and operated in accordance with the approved Noise Impact Statements. The class of Noise Impact Statement required will be determined by the Commissioner of Public Works and the Environment in accordance with City Council policy.**

EXPLANATION

Current and future noise levels at the Ataratiri site are high enough to be of concern for residential uses but can be reduced to acceptable levels through careful site planning, architectural design and the use of berms/walls. The major off-site noise sources of concern are the Don Sorting Yards and the transportation corridors that pass through or close to the site. The recommendations outlined above will ensure that the appropriate noise reduction measures are put in place to protect the residents of Ataratiri from unacceptable noise levels.

RECOMMENDATION 8

That the Commissioner of Public Works and the Environment require any approved redevelopment plans for the Gooderham & Worts site to include adequate consideration of the potential impact of noise from the redevelopment on Ataratiri and ensure that appropriate noise reduction measures are incorporated into its design.

RECOMMENDATION 9

That the Minister of the Environment require GO Transit to include in any class environmental assessment or full environmental assessment an adequate consideration of the noise and vibration impacts of any GO station located in the vicinity of Ataratiri on the future residents of Ataratiri, and ensure that any necessary noise and vibration control measures are incorporated into its design.

EXPLANATION

The redevelopment of Gooderham & Worts and the possible location of a GO Transit station in the vicinity of the site represent two possible sources of noise and vibration that were identified but not characterized in this report because it is not yet know what form they will take. If the Gooderhams & Worts site is redeveloped, it will be the subject of planning approvals. If a GO Transit station is proposed it likely will be required to go through an environmental assessment.

SOIL, GROUND AND STORM WATER QUALITY

CONCLUSIONS

Soil and groundwater testing at the Ataratiri site has identified the type and distribution of contaminants in soil and groundwater. The contaminants originate from industrial activities and the fill that was used to raise the elevation of portions of the site. The main contaminants of concern in the soil are metals, PAHs and PCBs. Approximately one-third of the site has not yet been sampled.

Soil contamination is generally confined to the upper layer of fill. An exception is the site of the former coal gasification plant where contamination extends into the underlying native material and possibly into the bedrock. The main contaminants of concern in the groundwater are cyanide, PAHs and hydrocarbons. The major areas of groundwater contamination occur in Block A (the former location of the coal gasification plant) and Block M (see Figure 5.1).

No key concerns associated with storm water quality were identified. The proposed change in land use and the proposed storm water retention facility will improve the quality of storm water that will be discharged from the site.

The Ministry of the Environment soil clean-up guidelines and refinery site guidelines have been used to evaluate soil quality at Ataratiri. New soil quality guidelines have been developed for those compounds for which no province-wide or site-specific guidelines were available. The guidelines which have been used to evaluate soil quality will be more stringent than necessary for contaminated soil at depth because of the opportunities for exposure to contaminated soil at depth will be less.

An assessment of potential health risks associated with future soil and groundwater quality can not be satisfactorily carried out until the Ministry of the Environment has approved all of the soil quality guidelines that will be used at Ataratiri, the distribution of land uses has been finalized, and a detailed soil and groundwater clean-up plan has been prepared. The chemicals and exposure pathways of most concern to future residents, remediation workers, and site neighbours already have been identified. An approach for assessing potential health risks at the redeveloped site has been proposed.

Techniques for cleaning-up soil and groundwater were examined. A short list of options have been recommended for further study and used as the basis for a soil and groundwater management plan.

A preferred soil management strategy has been prepared on the basis of the contaminants of concern, the estimated volumes of material that need to be addressed, the ten soil clean-up options that have been recommended for further consideration and regulatory requirements. The plan involves: temporary on-site storage of soil that contains greater than 25 *ug/g* of PCB; treatement or off-site disposal of leachate toxic soil; treatment of soil that exceeds the residential guidelines by a factor of five or more; on-site management or treatment of soil that exceeds the residential guidelines by a factor of five or less; and off-site disposal of surplus soil that will need to be excavated and removed to accomodate foundations and underground structures. Environmental fate and risk assessment procedures will need to be used to demonstrate the appropriateness of on-site management.

The estimated soil clean-up costs for the preferred soil management strategy range from $61.5 to $161.4 million depending on the degree of clean-up that will be required. These cost estimates can be refined further when the results of bench and pilot scale testing become available and once a decision is made on how the guidelines that are being recommended for surface soils at Ataratiri should be applied to contaminants at different depths.

RECOMMENDATION 10

That detailed soil and groundwater management plans be prepared for each area of the site and submitted to the Director of Central Region of the Ministry of the Environment for approval. The plans should identify:

i) the clean-up guidelines that will be applied to each development block;

ii) if and how contaminated soil should be cleaned-up and where any contaminated soil which is removed will be stored, treated or disposed;

iii) the results of additional sampling and bench and/or pilot scale tests that are relevant;

iv) the location of underground fuel storage tanks and valves, pipelines and gas mains;

v) appropriate decommissioning procedures for handling and disposal of underground tanks, any residual liquids/sludges contained in the tanks, and any contaminated soils adjacent to the tanks; and

vi) those soil and groundwater clean-up strategies that should be coordinated with flood protection measures;

vii) those soil and groundwater clean-up measures that should be implemented on a development block basis and those that should be implemented on a basis larger than the development block;

viii) those soil and groundwater clean-up measures that should be carried out before construction starts and those that should be carried out or completed after construction starts on the parts of the sub-area to which the remediation measures relate;

ix) the steps that will be taken to protect the environment and the health and safety of neighbours during the remediation program; and

x) the results of a health risk assessment to ensure that the proposed clean-up plan will adequately protect the health of future residents. The health risk assessment should address the pathways of exposure and the contaminants of concern that will remain at the site after remediation has been completed.

EXPLANATION

Condition 3 of the Exemption Order requires that detailed soil and groundwater management programs be prepared for each area of the site and submitted to the Director of Central Region of the Ministry of the Environment for approval. The programs are to examine if, how, and where contaminated soil should be removed. The above recommendation will ensure that the soil and groundwater management programs are comprehensive and complete. One of the key components of the above recommendation is the health risk assessment. It is required to ensure that the proposed soil and groundwater clean-up plan will adequately protect the health of future residents of the area under consideration.

RECOMMENDATION 11

That health risk assessments be carried out for soil and groundwater clean-up options that involve isolating contaminated soils or groundwater on-site and are likely to release contaminants into the environment before they are approved for use at Ataratiri.

RECOMMENDATION 12

That health risk assessments be carried out for soil and groundwater treatment options that are likely to release contaminants into the environment before they are approved for use at Ataratiri.

EXPLANATION

Several soil and groundwater clean-up methods that involve leaving contaminants on-site (e.g., microencapsulation, isolation), or treatment options that have the potential to release vapours or particulate matter to the atmosphere (e.g., bioremediation, excavation and disposal) have been recommended for further consideration at Ataratiri. These methods should be examined from a health risk perspective, if it is likely that they will release contaminants into the environment, before they are approved for use at Ataratiri.

RECOMMENDATION 13

That contaminated soil and groundwater at Block P (554 Lakeshore Boulevard East) be addressed when 480 Lakeshore Boulevard East is cleaned-up.

EXPLANATION

Block P appears to be contaminated, in part, by hydrocarbons moving onto the site. Prior to remediating Block P, it would be preferable to remove any off-site sources of contamination before cleaning-up Block P.

RECOMMENDATION 14

That the Ministry of the Environment's soil clean-up guidelines and the refinery site guidelines described in Table 4.2 of this report be adopted for surface soil at Ataratiri.

EXPLANATION

The Ministry of the Environment's soil clean-up guidelines apply to sites across the province. In addition, the various types of contaminants present in Ataratiri soils requires that the Ministry of the Environment guidelines be supplemented with other guidelines. For Ataratiri, the guidelines recently developed for the two refinery sites west of Toronto can be used to evaluate the concentrations of many organic parameters. Guidelines for the six additional PAHs have been derived for the City for use at Ataratiri and have been submitted to the Ministry of the Environment for comment. Although these guidelines likely will be more stringent than necessary for Ataratiri when applied at depth, they are appropriate for surface soils.

RECOMMENDATION 15

That the issue of how the soil guidelines identified in recommendation 12 should be applied to contaminants at different depths be addressed before the detailed soil and groundwater remediation plans for each area of the site are approved.

EXPLANATION

Much of the information that was used to establish the Ministry of the Environment's soil clean-up guidelines is based on effects on plants and strongly suggests that the guidelines may best be suited to soils which are at or close to the surface. In addition, neither the Ministry of the Environments soil clean-up guidelines or the refinery site guidelines consider Ataratiri specific factors, such as the separation of residents from the underlying soils that will occur at Ataratiri and which will reduce the exposures of future residents at Ataratiri to chemicals in these soils. For these reasons, and because of the potentially high costs associated with cleaning up all of the soil that exceeds the guidelines that have been recommended for surface soils at Ataratiri, the issues of how the soil guidelines should be applied to contaminants at different depths should be addressed.

RECOMMENDATION 16

That the Minister of the Environment advise the City Council of the appropriate soil quality guidelines to be used for those compounds for which province-wide or site specific guidelines are not available when she informs City Council of her decision on the Environmental Evaluation Study report.

EXPLANATION

Province-wide and site specific guidelines are available for all but six PAH compounds measured at Ataratiri. Candidate guidelines for these six PAHs have been developed and submitted to the Ministry of the Environment for review but have not yet been approved for use at Ataratiri.

RECOMMENDATION 17

That the Ministry of the Environment advise the Medical Officer of Health and the Commissioner of Housing of any changes to the soil quality guidelines that are recommended for use at Ataratiri. Any changes should be incorporated into subsequent soil and groundwater management plans that are prepared for Ataratiri.

EXPLANATION

New information is available that could not have been considered in the development of the province-wide guidelines. Ministry staff have informed City staff the current guidelines are under review.

RECOMMENDATION 18

That a storm water retention tank designed to meet the appropriate water quality standards be installed in Ataratiri.

EXPLANATION

Although strorm water management is not a common condition of development approval in a built-up urban area with an established sewer system, redevelopment at the scale of Ataratiri provides the opportunity to provide a new storm water management system that will improve the quality of storm runoff. Consultants studies have recommended that a tank be located on the block south of Mill Street and east of Cherry Street.

FLOOD RISK

CONCLUSIONS

Numerical modelling of the 1-in-350 year flood level and Regional Storm conditions has shown that virtually all of Ataratiri (as well the adjacent St. Lawrence Neighbourhood, much of the downtown and a considerable area to the east and south of Ataratiri) lies in the flood plain of the Don River. Floodproofing is required to make the site safe for its intended use.

Filling part of the Ataratiri site to raise grades up to 3.5 m will reduce the depth of flooding on the site under the Regional Storm to 1 m or less and protect lands between Parliament and Bay Streets. Slightly higher flood levels would occur to the east and south as a result of the placement of this fill. Ataratiri can be completely protected from flooding under the Regional Storm, and the risk of flooding on adjacent sites reduced if the openings under the CNR and other downstream bridges are widened and fill is placed on the Ataratiri site.

On-going maintenance dredging of the Keating Channel is required to provide the required level of flood protection.

Floodproofing to be located outside of the Ataratiri site is not currently included in the Exemption Order for Ataratiri. An amendment to the Exemption Order will be required to include any off-site floodproofing that may otherwise be part of an Environmental Assessment.

RECOMMENDATION 19

That the nine-point plan described in Section 6.4.2 of this report be adopted as the preferred approach for flood protection for Ataratiri.

RECOMMENDATION 20

That flood protection policies for the site be incorporated into the Official Plan Amendment for Ataratiri. The policies should include a flood warning system and an emergency response plan and requirements for area-specific flood protection plans.

RECOMMENDATION 21

That the detailed flood protection plans be prepared for each area of the site and submitted to the Metropolitan Toronto and Region Conservation Authority for approval. The plans should cover at least the area under consideration and should identify those flood protection measures that should be carried out prior to construction and those that should be carried out or completed after construction has begun.

EXPLANATION

The nine point plan described in section 6.4.2 has been discussed extensively among the members of the Special Policy Area (SPA) Technical Committee that has been established to direct flood protection decisions at Ataratiri. It addresses the need to protect the lower Don River through a series of measures that can be staged in a timely manner and which can ultimately achieve protection to the level of the Regional Storm. The Special Policy Area Policies will be incorporated into the Part II Official Plan for Ataratiri. As site development will occur in relatively distinct phases, the Metropolitan Toronto and Region Conservation Authority will need to consider the effectiveness of the protective steps to be taken for each, both prior to and during construction. These will include the establishment of finished grade elevations, the elevation of openings, and the methods of construction in relation to the need to withstand possible flooding, until such time as full protection to the level of the Regional Storm is achieved through the placement of fill on the Ataratiri site and the downstream channel improvements.

TRANSPORTATION AND FIXED FACILITY RISK

CONCLUSIONS

The risks from the transportation of hazardous goods by road and rail corridor, nearby industrial facilities and utilities, and marine-related activities in the Port Industrial District have been studied. The southeast corner of Ataratiri is exposed to the highest risk as a as it is close to two rail lines and four major road ways.

The risks from the transportation of hazardous goods on roads in Ataratiri is less than that for the adjacent St. Lawrence neighbourhood except for Cherry Street which has the potential to be a significant source of risk to future residents due to its proximity and higher frequency of accidents. The closure of on-site industries is likely to reduce, but not eliminate, the transportation of dangerous goods on roads in Ataratiri. The risk could be further reduced by limiting or prohibiting the transport of dangerous goods on roads in Ataratiri.

Transportation of hazardous materials on rail lines to the south and east of Ataratiri poses risks that are comparable to risks from other rail lines in the Greater Toronto area. Beyond 30 m from the rail lines, levels of individual risk are estimated to be below ten-in-a-million. The redevelopment of Ataratiri offers an opportunity to improvements, from a risk point of view, by making more water available along the rail line and constructing drainage controls to limit the extent of spills.

Facilities in the Port Industrial Area are unlikely to pose a significant risk to residents of Ataratiri.

The risks associated with natural gas pipelines crossing the Don River is not expected to be significantly different from other natural gas pipelines operating under similar conditions.

RECOMMENDATION 22

> **That emergency response agencies be consulted about the design of open spaces along the southern and eastern borders of the site to ensure that adequate consideration is given to emergency response requirements associated with accidents on the rail corridors.**

EXPLANATION

> In the current site plan all buildings are set back a minimum of 30 m from the rail corridors that border the southern and eastern edges of the site and major open

spaces are located in these areas. Because of the need for emergency response agencies to respond quickly to any accident that may occur on the rail corridor it is important that the open spaces that are planned for these areas be designed in a manner that does not unduly hinder their respone.

RECOMMENDATION 23

That the Commissioner of Public Works and the Environment examine ways of reducing the amount of truck traffic, particularly that carrying dangerous goods, on Cherry Street while not increasing the traffic volumes through adjacent residential neighbourhoods.

EXPLANATION

Cherry Street will continue to be a major source of risk to residents of Ataratiri due to the transport of hazardous goods unless steps are taken to significantly reduce or eliminate. The most effective means of reducing risk from road transportation of hazardous goods in Ataratiri is to place restrictions on the transportation of hazardous materials on certain routes. Care must be taken so as not to shift the risk to neighbouring communities.

PUBLIC CONSULTATION

CONCLUSIONS

Extensive public consultation has been carried out as part of the preparation of the Environmental Evaluation Study report for Ataratiri. The main opportunities for public participation have included: the involvement of the Ataratiri Neighbourhood Advisory Council (a citizen's group created especially to provide input into the Ataratiri planning process); public meetings; and information materials such as the newsletter.

The eleven goals of the Ataratiri Neighbourhood Advisory Council's Environmental Subcommittee have guided the preparation of this report.

The requirement of the Exemption Order for public review of and comment on the Environmental Evaluation Study report is being met through the involvement of the public in the preparation of this report, the release of the report for public review and comment, and the provision of $75,000 to assist community and environmental groups in their review.

RECOMMENDATION 24

That a public file on Ataratiri clean-up activities be maintained by the City Clerk, in the Municipal Reference Library, City Hall Branch and in the Community Health Centre that is planned for Ataratiri.

EXPLANATION

One of the 11 goals established by the Neighbourhood Advisory Council's Environmental Subcommittee is to document the environmental clean-up process for the development so that future residents of Ataratiri can verify that appropriate steps were taken to address human health and safety concerns at the site. At a minimum, the file should contain the approved Environmental Evaluation Study report and the background environmental studies on which the report is based, the approved soil and groundwater clean-up plans for each area of the site, the environmental inspection reports, the certifications that the site and buildings comply with all necessary environmental safeguards, and the results of any long-term monitoring that may be required.

RECOMMENDATION 25

That a public consultation and communication plan be prepared as part of the detailed soil and groundwater management plan that will be prepared for each area of the site to ensure that site neighbours are adequately informed about site clean-up activities. The public consultation and communication plan prepared for each sub-area should identify how residents will be informed about clean-up activities and how they will be consulted on ways to minimize the impact of clean-up activities.

EXPLANATION

Residents who live adjacent to the areas of Ataratiri where remediation activies take place are the most likely to be adversely affected by clean-up activities that will be carried on at the site. It is important that they be consulted during the preparation of clean-up plans, kept informed of clean-up activities and have a mechanism available to address any problems that may arise in their community as a result of clean-up activities which are carried out at Ataratiri.

PLANNING AND INFRASTRUCTURE DESIGN

Environmental issues have been a key concern of the site planning process that has been carried out for Ataratiri. Many of the following recommendations address site planning measures that already have been taken to reduce or eliminate environmental concerns. These measures now should be included in the Part II Official Plan Amendment for Ataratiri. Other recommendations are directed towards the design of infrastructure to ensure that the site will be designed in a manner that facilitates emergency response. Some of the recommendations were provided by agencies that reviewed an earlier draft of this report.

RECOMMENDATION 26

That residential, commercial or institutional uses not be permitted within 30 m of the transportation corridors along the east and south borders of Ataratiri in order to avoid the need for vibration control and to reduce the risk associated with accidents involving dangerous goods to below ten-in-a-million.

RECOMMENDATION 27

That residences, schools and daycare facilities not be located adjacent to the Eastern Avenue Diversion or the southern portion of Cherry Street unless adequate noise reduction can be provided.

RECOMMENDATION 28

That, where noise levels exceed the Ministry of the Environment's residential noise guidelines, outdoor living areas or common courtyards of residential buildings be located within the interior of buildings to ensure that noise levels are not exceeded.

RECOMMENDATION 29

That all dwellings located next to transportation corridors and arterial roads be equipped with mechanical ventilation. If small outdoor condensing units are used, they should be placed in noise insensitive locations away from outdoor living areas.

EXPLANATION

Locating buildings at least 30 m from the rail corridor will eliminate the need for vibration control measures and reduce the risk due to the transportation of dangerous goods on the rail corridor to below ten-in-a-million. Building setbacks, architectural design and zoning will reduce or eliminate the adverse impacts of noise associated with the transportation corridors.

RECOMMENDATION 30

That the number of dead-end streets, 'tight turns' and bridges over streets between buildings be minimized to ensure that emergency response vehicles are not unduly hindered.

RECOMMENDATION 31

That sufficient off-street parking be provided for residents of Ataratiri to ensure that night-time emergency access is not unduly hindered due to illegal parking.

EXPLANATION

Emergency access is an important consideration in the planning of any development. Recommendations 30 and 31 are based on the experince of the City of Toronto Fire Department.

RECOMMENDATION 32

That site planning studies be carried out to determine an appropriate design of the Don River park and the fill embankment consistent with the goal of creating a natural edge to the river.

RECOMMENDATION 33

That consideration be given to the migratory patterns of birds when establishing building heights and set backs next to the Don River Valley.

EXPLANATION

Recommendation 32 is consistent with the aims of the Task Force to Bring Back the Don and the Ataratiri Neighbourhood Advisory Council Environmental Subcommittee's goal of implementing "a planning and development strategy that is consistent with the goal of restoring the Don River to a more natural state". Recommendation 33 will ensure that consideration will be given to the migratory patterns of birds in establihsing buildings heights and set backs next to the Don River Valley. The latter responds to a concern raised by members of the Task Force to Bring Back the Don.

RECOMMENDATION 34

That the City provide water along the rail corridor where existing or proposed streets abut or intersect the rail corridor to allow emergency personnel to respond more effectively to hazards associated with accidents involving dangerous goods along the rail corridor.

RECOMMENDATION 35

That drainage controls be provided along the southern edge of the site to help limit the extent of spills. The drainage controls should include means to prevent contaminants from escaping into the environment.

EXPLANATION

Recommendations 34 and 35 are examples of improvements that can be made to the infrastructure around the rail lines to minimize the adverse effects of accidents involving dangerous good at minimal cost. Increasing the availability of water to the areas along the rail line will allow emergency personnel to more effectively contain the hazardous should accidents occur. Drainage controls would help to limit the extent of spills and the possible introduction of materials into the interior of the community. The storm water retention tank that is proposed for the block south of Mill Street and east of Cherry Street may provide opportunities for capturing and storing spills thereby preventing discharges into the sewer system.

PLANNING AND APPROVALS

CONCLUSIONS

An amendment to the City of Toronto's Offical Plan and zoning by-law will be required to permit the proposed change in land use from industrial to mixed residential/commerical/industrial.

The subdivision approval process under Section 50 of the Planning Act is the primary means of implementing environmental policies at Ataratiri.

Several amendments will be required to the Ataratiri Exemption Order to permit the proposed planning approval process, avoid the possibilility of a separate and possibly lengthy rezoning process for each area of the site, and allow timely implementation of the recommended flood protection package.

RECOMMENDATION 36

That a sub-area Soil and Groundwater Management Plan be prepared for each sub-area of site and submitted to the Director of Central Region of the Ministry of the Environment for approval as a condition of subdivision approval. The sub-area Soil and Groundwater Management Plans shall contain the results of the detailed studies identified in recommendations 10, 11, 12 and 15 of this report.

EXPLANATION

Condition 3 of the Ataratiri Exemption Order requires that detailed soil and groundwater management plans be prepared for each area of the site and submitted to the Director of Central Region of the Ministry of the Environment for approval prior to the approval of zoning by-law amendments. However, subdivision approval process under Section 50 of the Planning Act is the primary means of implementing environmental policies at Ataratiri. Requiring the successful completion of the detailed studies required under Condition 3 to be a condition of subdivision phasing rather than zoning approval will meet the original intent of the Exemption Order by ensuring that development can not take place until the Ministry of the Environment and the Metropolitan Toronto and Region Conservation Authority are satisfied that the necessary environmental remediation has or will take place while avoiding the need for a separate and potentially lengthy rezoning process each time a sub-area is proposed for development.

RECOMMENDATION 37

That a sub-area Environmental Plan be prepared for each sub-area of the site submitted to the Director of Central Region of the Ministry of the Environment for approval as a condition of subdivision approval. The sub-area Environmental Plan shall include the results of the detailed studies identified in recommendations 3 and 6 of this report that are relevant to the sub-area under consideration.

EXPLANATION

Condition 4 of the Ataratiri Exemption Order requires that detailed studies on key environmental concerns identified in the EES report be prepared for each area of the site and submitted to the Director of Central Region of the Ministry of the Environment for approval prior to the approval of zoning by-law amendments. The key environmental concerns that need to be addressed under condition 4 are addressed in recommendation 3 and 6. The reason for making these studies a condition of subdivision approval rather than zoning approval are the same as those outlined in recommendation 36.

RECOMMENDATION 38

That a sub-area Flood Protection Plan be prepared for each area of the site and submitted to the Director of Central Region of the Ministry of the Environment for approval as a condition of subdivision approval. The sub-area Flood Protection Plans shall contain the results of the detailed flood protection studies identified in recommendation 20.

EXPLANATION

Flood protection is one of the key environmental concerns covered by condition 4 of the Ataratiri Exemption Order. The reason for making these studies a condition of subdivision approval rather than zoning approval are the same as those outlined in recommendation 36.

RECOMMENDATION 39

That a consulting engineer be required to prepare and submit an Environmental Inspection Report to the Director of Central Region of the Ministry of the Environment for approval before the holding symbol on a development block is removed. The report shall:

i) certify that remedial work required by the Sub-Area Environmental Plan, the Sub-Area Soil and Groundwater Management Plan and the Sub-Area Flood Protection Plan to be carried out prior to the commencement of construction on that part of the site has been properly completed; and

ii) describe how the remedial work has been done and what if any remedial work remains to be done.

EXPLANATION

Condition 5 b) of the Exemption Order provides that the holding symbol on any part of the site be removed only when a consulting engineer has certified that the preconstruction remedial work required by earlier reports and plans has been properly completed. Further, the consultant is expected to prepare a report documenting what remediation work has been carried out, what remains to be done and "that the property is safe for the intended land use". A copy of the certificate must then be submitted to the Ministry of the Environment.

The above recommendation assumes that the site will be "safe for the intended land use" if the remedial work required by reports which have previously approved by the Ministry of the Environment has been properly carried out.

RECOMMENDATION 40

That, prior to the issuance of a building permit, the owner shall certify that the site and building plans meet all of the necessary environmental requirements and incorporate all of the necessary environmental safeguards indentified in the approved Sub-Area Environmental Plan, Sub-Area Soil and Groundwater Management Plan, Sub-Area Flood Protection Plan, Environmental Inspection Report and any other approved environmental reports.

EXPLANATION

Condition 5 g) of the Exemption Order requires that the Official Plan Amendment for Ataratiri provided that an environmental consultant be retained by the City to certify that all site plans and building plans comply with environmental requirements. To be consistent with City procedures under similar circumstances (such as the procedure that is followed for Noise Impact Statements) and to avoid an unreasonable cost to the public, the recommendation above shifts the responsibility for providing the appropriate assurances from the City to the owner.

1.0 INTRODUCTION

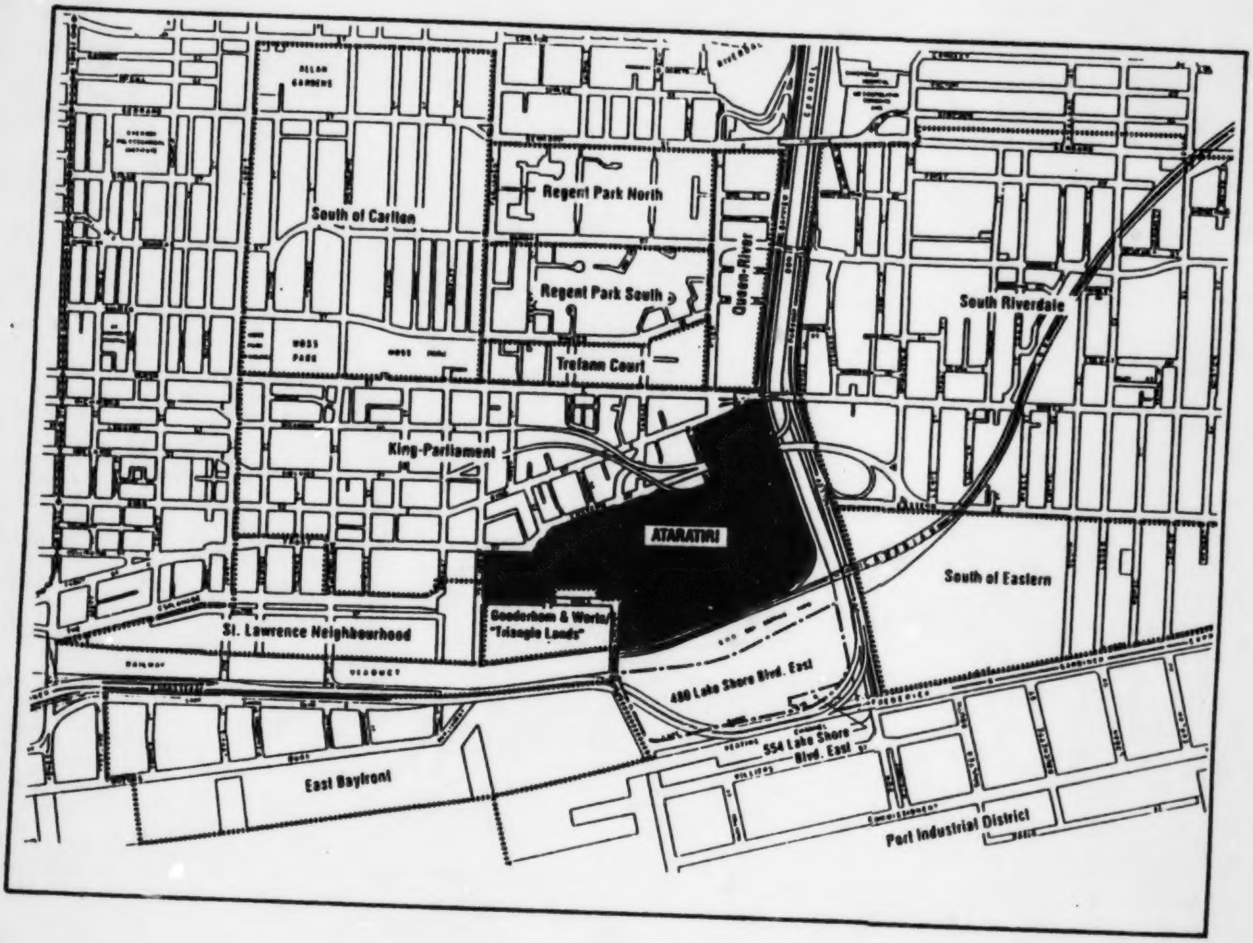
1.1 Background

Ataratiri is a major redevelopment initiative jointly proposed by the City of Toronto and the Province of Ontario. Initially referred to as St. Lawrence Square, the primary objective of Ataratiri is to increase the supply of affordable housing in Toronto. Approximately 14,000 people will live in the new neighbourhood which will include a mix of housing types, community and social services to meet the needs of its residents, and commercial and light industrial activities to provide employment for approximately 1,500 people.

The Ataratiri site is located east of downtown Toronto, east of the St. Lawrence Neighbourhood in the King-Parliament Planning Area (Figure 1.1). Bounded by Parliament Street to the west; Front Street East, Eastern Avenue, St. Lawrence Street, and King Street to the north; Bayview Avenue to the east; and the rail corridor to the south (Figure 1.2), the Ataratiri site covers approximately 32 hectares (80 acres). The Gooderham & Worts distillery complex that straddles Mill Street between Parliament and Cherry Streets is not part of Ataratiri, but is planed for redevelopment by its owners. The rendering plant at 554 Lakeshore Boulevard, south of the railway corridor, was identified as an unacceptable source of odours in the area and was expropriated in July 1988. The site is not part of the redevelopment area.

It will be desirable to coordinate redevelopment plans for Ataratiri with those for neighbouring areas. Foremost among these is the Gooderham & Worts distillery site. Three other initiatives which may affect Ataratiri, and to which Ataratiri may contribute, are in the planning stages: the Gardiner/Lakeshore Task Force, the Task Force to Bring Back the Don, and the Royal Commission on the Future of the Toronto Waterfront. As well, Ataratiri should relate to the existing Corktown neighbourhood to its north.

Since first proposed, it has been known that many environmental challenges would be faced during the development of Ataratiri. Local soil and groundwater quality have been adversely affected by past land uses. Local air quality, and noise and vibration levels are affected by industrial activities and transportation corridors located in or near the area. Virtually all of Ataratiri lies within the regional flood plain of the Don River. On the other hand, the site offers several advantages. It is close to downtown and it can be easily integrated into the existing physical and social infrastructure. It presents an opportunity to bring jobs and people together and to promote the use of public transit. Its development can improve the amenities of adjacent communities and it could enhance the initiatives underway to rehabilitate the lower Don River.



Allan Gardens
South of Carlton
Regent Park North
Regent Park South
Moss Park
Trefann Court
Queen-River
South Riverdale
King-Parliament
ATARATIRI
South of Eastern
Gooderham & Worts/"Triangle Lands"
St. Lawrence Neighbourhood
480 Lake Shore Blvd. East
554 Lake Shore Blvd. East
East Bayfront
Port Industrial District

1.1

Planning Context

1.2 The Ataratiri Environmental and Planning Approval Processes

1.2.1 Overview

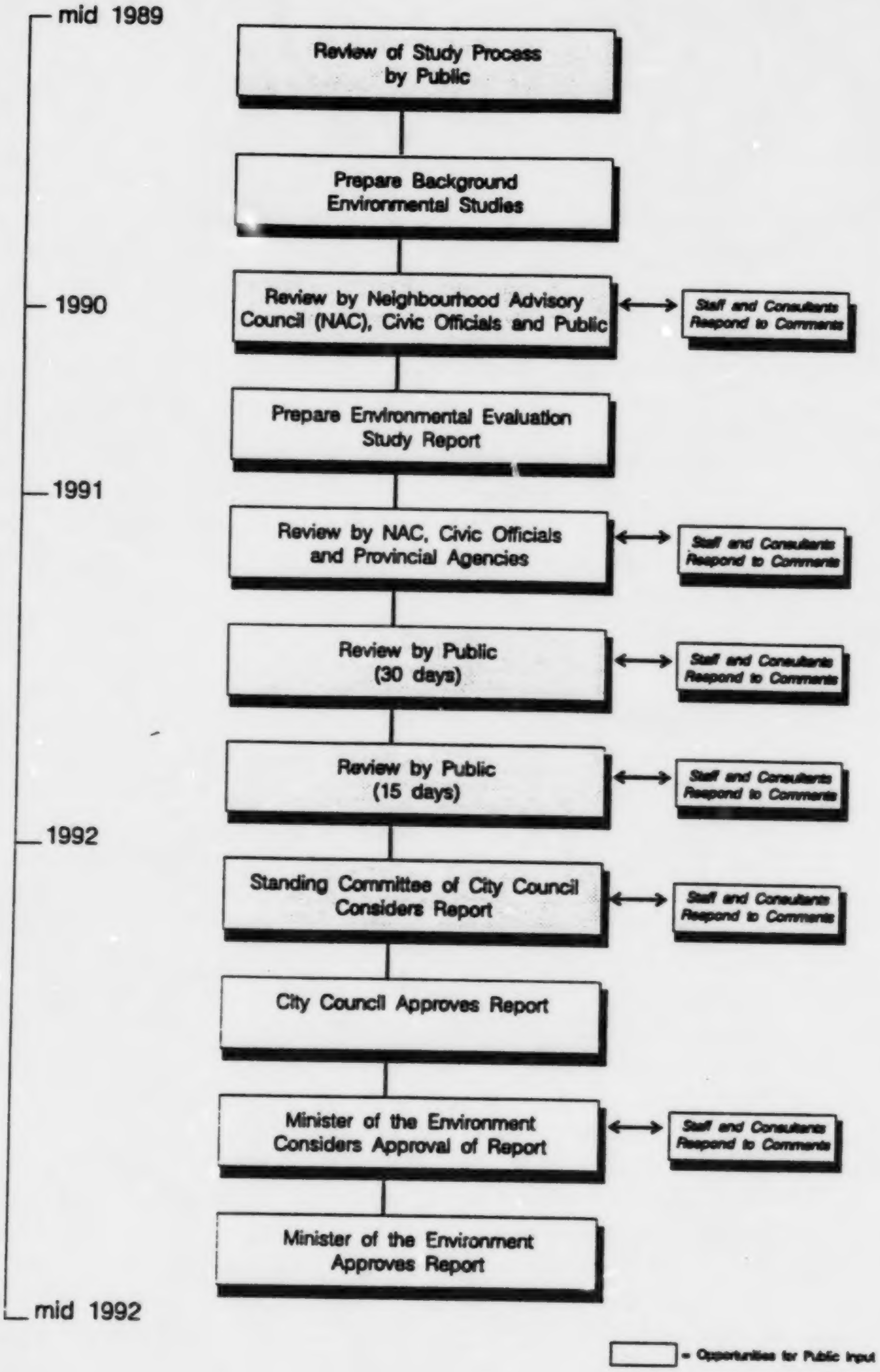
The redevelopment of Ataratiri will require both municipal and provincial approvals. Three separate approval processes are being followed: environment, land use planning, and flood plain planning. These processes arise from the Environmental Assessment Act (EAA) and the Planning Act.

1.2.2 Environmental Approval Process

Municipal non-profit housing and related uses are not normally subject to the EAA; however, it was anticipated that the EAA could apply to Ataratiri given the scope and scale of the development. In response to the pressing need for non-profit housing, the City of Toronto applied for an exemption from the EAA in July 1988. At the same time, the City proposed to follow a process of environmental studies, report preparation, public review, and agency approval that would address environmental concerns arising from the site's location and history. On 13 July 1988, the Minister of the Environment granted the City an exemption for the Ataratiri development. A copy of the Exemption Order is provided in Appendix A. The environmental approval process for Ataratiri arises from the Exemption Order.

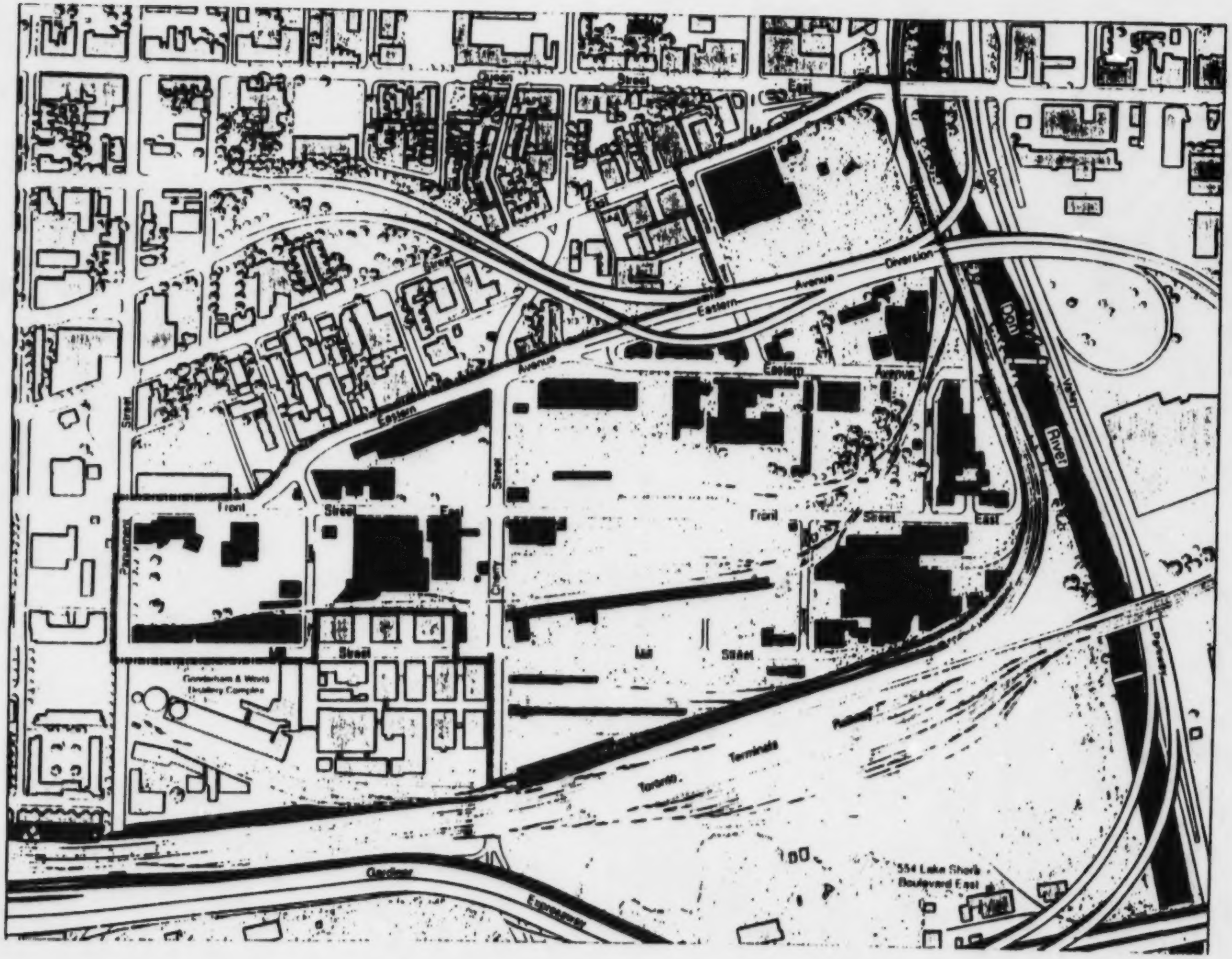
The exemption is subject to 11 terms and conditions. Several of the conditions require environmental studies. Condition 2 states that "an environmental overview study shall be undertaken by the proponent and submitted to the Minister of the Environment for approval following an opportunity for public notice, review and comment, before the Official Plan Amendment(s) for the undertaking is submitted to the Minister of Municipal Affairs for approval under the Planning Act," and that the study shall identify key environmental concerns on and off the site, including any effects on health, soil quality, air quality (including odours and dust), noise and vibration, water quality (including ground and storm water), and the presence or absence of waste associated with the former coal gasification plant that once was situated on part of the site.

Condition 2 also states that the environmental overview study (subsequently referred to as the Environmental Evaluation Study or EES) shall contain an overview of existing soil and groundwater quality conditions, propose soil and groundwater management plans for the entire site, and a risk analysis of injury or damage due to flooding or road and rail accidents. Also required are descriptions of the detailed environmental studies on impacts and mitigation measures and strategies that will be carried out for each part of the site prior to zoning by-law amendments, development agreements, or agreements of purchase and sale being entered into by the City for the development or disposition of that part of the site.


mid 1989
Review of Study Process by Public
Prepare Background Environmental Studies
1990
Review by Neighbourhood Advisory Council (NAC), Civic Officials and Public
Staff and Consultants Respond to Comments
Prepare Environmental Evaluation Study Report
1991
Review by NAC, Civic Officials and Provincial Agencies
Staff and Consultants Respond to Comments
Review by Public (30 days)
Staff and Consultants Respond to Comments
Review by Public (15 days)
Staff and Consultants Respond to Comments
1992
Standing Committee of City Council Considers Report
Staff and Consultants Respond to Comments
City Council Approves Report
Minister of the Environment Considers Approval of Report
Staff and Consultants Respond to Comments
Minister of the Environment Approves Report
mid 1992
= Opportunities for Public Input

1.3

Environmental Evaluation Study Process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Don
Valley
River
Parkway
Front
Street
East
Cherry
Street
Mill
Parliament
Gooderham & Worts
Distillery Complex
Toronto
Terminals
Railway
Gardiner
Expressway
554 Lake Shore
Boulevard East

■ Existing Buildings in Ataratiri

▨ Existing Buildings

1.2

The Site - Existing Conditions (1988)

Conditions 3 and 4 require the City to undertake detailed studies that identify the extent of environmental problems, suggest remedial strategies, and develop detailed soil and groundwater quality management programs that examine if, how, and where contaminated soil should be removed from portions of the site.

Condition 7 requires the City to report annually to the Director of the Environmental Assessment Branch of the Ministry of the Environment (MOE) on progress with the undertaking and compliance with conditions contained in, or arising from, the Exemption Order. At the time of the writing of this report, two annual reports (Commissioner of Housing 1989 and 1990) have been submitted to the Director of the Environmental Assessment Branch and placed in public reference locations. The release of this draft EES report for public review constitutes the annual report for 1990-1991.

1.2.3 Land Use Planning Approval Process

The Ataratiri site currently is designated for industrial use only in the City's Official Plan and Zoning By-Law. Requirements for changing these designations are contained in the Planning Act. The planning approval process for Ataratiri will take the form of a Part II Official Plan Amendment. The Ataratiri Part II Proposals report will recommend amendments to the Official Plan to permit the change in land use, provide for the necessary social and physical infrastructure, provide for environmental clean-up, and put into place the appropriate planning policies and conditions for development.

The first stage of the land use planning process was completed in the spring of 1990 with the submission of the report entitled *Ataratiri: Principles, Directions and Strategies* to City Council (Commissioners of Planning and Development and Housing, 1990). That report described work to date on Ataratiri (including the background environmental studies). Copies were placed in public reference locations and it was distributed to a wide range of agencies for review and comment.

Responses to public discussion and agency comments on the *Ataratiri: Principles, Directions and Strategies* report, the results of detailed planning studies, and the key results of the six background environmental studies will be presented in the report *Ataratiri: Part II Official Plan Proposals* (September 1991) which will be available for public discussion at approximately the same time as this EES report.

The results of public discussion on the proposals document and the draft EES report will be reflected in the *Ataratiri: Part II Final Recommendations* report which will be submitted to City Council for approval in early 1992. Amendments to the Official Plan proposed in the *Ataratiri: Part II Final Recommendations* report will be submitted to the Minister of Municipal Affairs for approval after the EES report has been submitted to the Minister of the Environment. An Ontario Municipal Board hearing will be required if there are any objections to the proposed Zoning By-Law changes, or requests for referral of the proposed Official Plan amendments.

1.2.4 Flood Plain Planning Approval Process

The Ataratiri Exemption Order requires that a risk analysis of injury or damage from flooding be undertaken. In addition, because virtually all of the Ataratiri site lies within the flood plain of the Don River, a separate approval process must be followed in accordance with the Province's Flood Plain Planning policy statement (Government of Ontario, 1988a). Under the authority of that policy statement, development in flood plains is normally prohibited or restricted. If there are reasons for doing otherwise, designation as a "Special Policy Area" (SPA) is one approach that can be used to permit new development in a flood prone area, subject to various conditions. Toronto City Council received approval-in-principle for SPA status for the entire lower Don River flood plain in December 1989. The approval-in-principle requires: that the necessary Official Plan policies be developed and approved in two stages, beginning with policies for the Ataratiri portion of the flood plain, and concluding with policies for the balance of the flood plain within two years of the date of preliminary approval; that the City examine a range of flood protection methods and their impacts on surrounding land; and that environmental issues be considered. The results of the risk analysis and the flood protection proposed for Ataratiri are described in Chapter 6. The flood plain planning policies that relate to Ataratiri are included in the *Ataratiri: Part II Official Plan Proposals* report.

1.3 The Ataratiri Planning and Development Process

1.3.1 Research and Planning

In addition to complying with the relevant approval processes, a comprehensive program of research is being carried out to address a wide range of issues involved in planning Ataratiri. The work is being carried out through a number of work streams. Urban design and physical planning issues, including the layout of roads, blocks and open spaces, are being addressed in the Urban Design and Physical Planning work stream. Population and housing mix targets for the new community and social service and community facility needs are being identified through the Social Structure work stream. Planning policies in and around Ataratiri are being developed in the Land Use work stream. A more complete description of the work that has been carried out in these and other work streams can be found in the *Ataratiri: Principles, Directions and Strategies* report. Green development policies are also being developed for Ataratiri. These are described in the *Ataratiri: Part II Official Plan Proposals* report.

A key aspect of planning Ataratiri is the integration of the six background environmental studies that have been carried out as part of the Environmental Approval Process and the Urban Design and Physical Planning work stream. Where possible, environmental constraints that have been identified are being dealt with through careful site planning. The site planning process is also weaving together the results of other work streams that have implications on the built form of structures. Coordination between the environmental and the site planning process takes several forms: informing site planning consultants of environmental constraints and suggesting mitigation measures that can be taken; having environmental consultants review and comment on the site plan at key stages in its development; and using physical and numerical models to analyze elements of the site plan to identify and propose solutions to potential environmental problems.

Through its evolution, the site plan is responding to environmental conditions in a number of ways. For example, residential buildings are being set back from transportation corridors which border the southern and eastern edges of the site. Taller buildings are being proposed for the south and east edges of the development and industrial land uses have been proposed along the edge of the Eastern Avenue flyover to buffer the interior of the site from noise. The proposed site plan will be fully described in the *Ataratiri: Part II Official Plan Proposals* report.

1.3.2 Site Improvement and Servicing

Preliminary planning has begun for the site improvement and servicing phase so that development can proceed in a timely manner once planning and environmental approvals have been granted. In addition to site improvement, which will involve soil and groundwater remediation and floodproofing, new services including roads and sewers will be required in most areas of the site. Alternatives for realigning existing roads (A.J. Freedman Associates, 1990) and managing storm water (Marshall Macklin Monaghan, 1991a) have been investigated. Work is also underway to investigate a centralized neighbourhood heating and cooling plant for the development, and to ensure that adequate public transit services will be available for the first residents.

1.4 Report Purpose and Organization

This EES report has been prepared to meet Condition 2 of the Exemption Order. The process being followed is shown in Figure 1.3. The process began with a public meeting in June 1989 to describe the process, discuss issues that were emerging at the time, and listen to public concerns. Between June 1989 and February 1991, six background environmental studies were undertaken to identify key concerns associated with developing the site. The results of these background studies were reviewed by numerous municipal and provincial agencies and members of the Ataratiri Neighbourhood Advisory Council

(NAC) and placed in public reference locations (see Chapter 8).

The results of the background studies were incorporated into a preliminary draft EES report which was reviewed by provincial agencies, municipal departments and NAC. It was then revised to respond to their comments and it is now being released for public review. All public comments that are received, and the responses to these comments, will be summarized and incorporated into a final EES report that will be submitted to City Council for approval.

The final EES report will be forwarded to the Minister of the Environment for approval before the Official Plan amendment is submitted to the Minister of Municipal Affairs. After reviewing the report, the Minister of the Environment will take one of the following actions: approve the report; approve the report but attach conditions; reject the report; or request additional studies/information prior to making a decision on approval.

Chapters 2 through 7 of this report describe the results of the six background studies that have been undertaken to identify any key concerns associated with developing the site.

Chapter 2 describes the existing local air quality, estimates how air quality could change, and identifies remedial strategies that may be needed to ensure that local air quality is suitable for the proposed development.

Chapter 3 presents the results of noise and vibration monitoring efforts, predicts future conditions, and identifies the remedial strategies that may be used to comply with current guidelines.

Chapter 4 characterizes local soil quality, presents a brief review of the methods that can be used to manage soils, and outlines the preferred soil management strategy for Ataratiri.

Chapter 5 characterizes local groundwater and storm water quality, describes methods that can be used to manage groundwater and storm water, and outlines the preferred groundwater management plan for Ataratiri.

Chapter 6 assesses the risk of injury and damage from flooding at Ataratiri and identifies the preferred flood protection strategy for the site.

Chapter 7 examines the risks of injury and damage from accidents upon road and rail corridors in the area and from fixed facilities (such as pipelines and fuel storage tanks) and identifies the actions that can be taken to reduce risks to acceptable levels. Copies of the background environmental reports have been placed at public reference locations described in Chapter 8.

Chapter 8 describes the public consultation process that has been carried out. At the end of the public review period, it will be updated to summarize submissions made or concerns raised by the public, and provide responses.

Chapter 9 describes how environmental conditions have been taken into consideration in the preparation of a site plan for Ataratiri.

Chapter 10 describes the environmental and planning approvals processes that will be followed in developing the site.

Following the text of the report is a glossary of scientific terms and words or phrases assigned specific meanings for this report and a list of the symbols and abbreviations used in the report. These are followed by Appendix A which contains a copy of the Ataratiri Exemption Order, and Appendix B which summarizes public comments and responses received to date. Finally, there is a list of report references.

2.0 AIR QUALITY

2.1 Overview

Many of the industrial, commercial, and transportation activities that take place at Ataratiri and in the surrounding area are sources of air pollution. The Ataratiri development will eliminate or lessen several of these sources.

Condition 2 of the Ataratiri Exemption Order states that key concerns associated with air quality (including odours and dust) should be identified and remedial actions proposed. Accordingly, the City retained Rowan Williams Davies & Irwin Inc. (RWDI) to undertake several tasks related to air quality at Ataratiri:

- analyze information from regular and special air quality monitoring programs;
- summarize odour complaints received by the MOE;
- summarize emissions data from industrial and transportation sources within and near the development site; and,
- characterize existing air quality.

This chapter summarizes the findings reported by RWDI (1991). It identifies the regulations, standards, and criteria that should be used to evaluate air quality at Ataratiri, assesses local air quality by comparing the results of several monitoring programs to those criteria, presents the results of mathematical models used to predict the effects of emissions from industrial sources and transportation corridors on local air quality, comments on human health aspects of the predicted air quality, describes the remedial options and strategies available for improving air quality, and recommends further studies that may be necessary.

2.2 Relevant Regulations, Standards, and Criteria

2.2.1 Federal Regulations

The control of air pollution sources is largely a provincial responsibility; however, the federal government can establish ambient air quality objectives and encourage provinces to adopt them. Prior to 1988, the Clean Air Act was the only piece of federal legislation that covered air pollution. In 1988, the Clean Air Act and several other pieces of federal legislation were consolidated into the Canadian Environmental Protection Act (CEPA). Elements of CEPA that are relevant to air quality and atmospheric emissions include the regulation of fuels and components of fuels, and the regulation of emissions from federal departments, boards, agencies, and crown corporations.

The emissions from new trucks and automobiles are regulated by the Federal Motor Vehicle Safety Act (1971). This act, administered by Transport Canada and supported by Environment Canada, sets limits on the tailpipe emissions (lead, carbon monoxide, nitrogen oxides, hydrocarbons, etc.) of all new motor vehicles.

2.2.2 Provincial Regulations

The legislation for protecting air quality in Ontario is contained in the Environmental Protection Act, the Environmental Assessment Act, the Pesticides Act, and the Provincial Offenses Act. Various regulations, policies, and guidelines have been set under these acts that are relevant to air quality at Ataratiri (MOE, 1987):

- Regulation 296 (Ambient Air Quality Criteria) defines ambient air quality criteria (AAQC) for 23 pollutants. These AAQC are maximum desirable, average concentrations of air pollutants measured during specific periods of time such as one hour, eight hours, 24 hours, 30 days, or one year.

- Regulation 308 (General Air Pollution) defines point-of-impingement (POI) standards for approximately 100 pollutants. The POI standards are concentrations that should not be exceeded by emission sources. Regulation 308 also describes the methods that should be used to calculate POI concentrations and defines the Ontario Air Pollution Index.

- In addition to the pollutants for which POI standards and AAQC have been set, interim standards, tentative design standards, guidelines, and provisional guidelines have been set for various chemicals by the MOE. These values, while not having the full legal status of standards or criteria, are used by the MOE in the same manner as the standards and criteria in the regulations.

- Regulation 311 (Motor Vehicles) ensures that used trucks and automobiles maintain the required pollution control equipment and meet emission standards. This regulation was enacted after the federal government assumed the role of regulating emissions from new vehicles.

- Regulation 312 (Sulphur Content of Fuels) limits the sulphur content of fuels (oil or coal) which may be used or sold in Metropolitan Toronto unless a certificate of approval has been obtained for the use of a higher sulphur fuel.

The MOE recently distributed a new draft regulation for comment. The new regulation, a part of the Clean Air Program, would change the way in which emission sources receive approvals, the degree of emission control required, and the mathematical models used to predict air concentrations. All of these changes are directed toward reducing atmospheric emissions and improving air quality. A schedule for implementing these changes has not been finalized.

2.3 Climate

The regional climate of Toronto and the north shore of Lake Ontario is influenced strongly by the prevailing westerly winds which move high and low pressure systems rapidly across the lower Great Lakes. Thus, the area is characterized by considerable variability in the weather. The climate is classified as humid continental with adequate precipitation in all seasons and temperatures ranging from sub-freezing in winter to very warm in summer. Lake Ontario has a moderating influence on the overall climate.

The local climate for the Ataratiri neighbourhood differs subtly from the regional climate. Climate data collected from the Toronto Island Airport, a few kilometres to the southwest, is considered to be more representative of the Ataratiri site than the data collected from the L.B. Pearson International Airport. Because of the proximity of Lake Ontario to the Ataratiri site, temperature extremes are tempered, precipitation is slightly altered (i.e., less snow and more rain in winter), and humidity is increased. Average wind speeds are also slightly higher due to southerly winds which reach the area after crossing Lake Ontario. The wind blows most frequently from the east and west.

Winds blowing off the lake also can effect the dispersion of atmospheric pollutants. Lake breezes often have a beneficial effect on dispersion but differences between lake and land temperatures can inhibit dispersion along the boundary between cool air over the lake and warm air over the land. These effects are especially pronounced in the spring and early summer.

2.4 Ambient Air Quality

2.4.1 Local Air Quality Monitoring

The MOE monitors air quality at numerous sites in the City of Toronto. The monitoring program includes the continuous monitoring of pollutants such as sulphur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), nitrogen oxides (NO_x), nitric oxide (NO), nitrogen dioxide (NO_2), total hydrocarbons (THC), total suspended particulate matter (TSP), constituents of TSP such as lead, and dustfall.

None of the regular air quality monitoring programs undertaken by the MOE included stations at the Ataratiri site. Monitoring stations near Ataratiri have been located at

Sherbourne/Wilton, 26 Breadalbane, and 381 Yonge Street (see Figure 2.1). The Sherbourne/Wilton monitoring station, which operated from 1983 to 1986, was located about 400 m west of Ataratiri. Its measurements are taken to be the best available indicator of air quality at Ataratiri. Given that several industrial sources in the vicinity of the station have closed since 1986, data from the station likely represent upper limits of concentrations at Ataratiri during the last couple of years. The station at 26 Breadalbane is considered to be representative of ambient air quality in downtown Toronto, and the station at 381 Yonge is representative of air quality next to a busy downtown street.

Collectively, the data gathered from these stations between 1983 and 1989 suggest that air quality at Ataratiri has the following characteristics:

- Only two pollutants frequently exceed the AAQC: ozone and TSP.

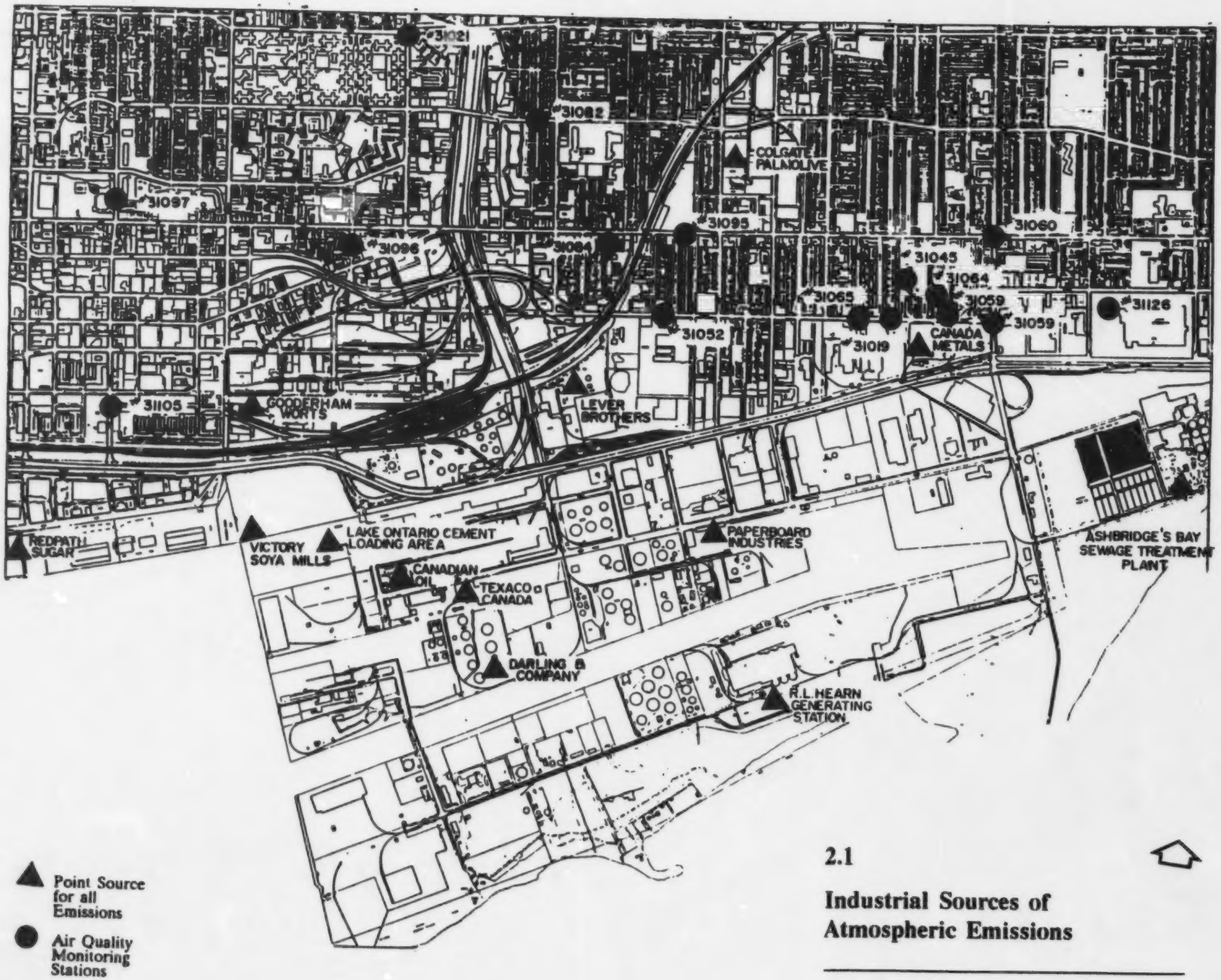
- The AAQC for ozone is exceeded on a regular basis but this condition is common during the summer months throughout southern Ontario. Ozone is produced through a series of photochemical reactions in the presence of sunlight and warm temperatures. The ozone observed in southern Ontario is often produced in air masses which have crossed the midwestern United States.

- No trends, neither upward nor downward, are evident in the data for various gaseous pollutants measured in the vicinity of Ataratiri. This lack of a trend is evident in the data for sulphur dioxide, carbon monoxide, ozone, nitrogen oxides, and total hydrocarbons.

- The levels of TSP and dustfall measured at four stations in the vicinity of Ataratiri frequently have exceeded the AAQC for TSP and it is likely that the same conditions have been occurring at Ataratiri. Across Metropolitan Toronto, the 24-hour AAQC for TSP is exceeded between 5 and 10% of the days and the annual geometric means are usually near the annual AAQC. Major contributors to the TSP and dustfall at Ataratiri likely include local industries, transportation corridors, and dust from vehicles operating in open areas.

- Lead levels in TSP have been measured at three of the sites and were below the 24-hour AAQC for lead. Only the TSP samples collected at 26 Breadalbane have been measured for several metals. None of the AAQC for those metals were exceeded in any of the samples.

- Data for TSP and the metals content of TSP do not display any trends, with the exception of a downward trend in lead content. This is consistent with the declining consumption of leaded gasoline that occurred during the late 1980s.



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VICTORY SOYA MILLS
LAKE ONTARIO CEMENT LOADING AREA
PAPERBOARD INDUSTRIES
ASHBRIDGE'S BAY SEWAGE TREATMENT PLANT
CANADIAN OIL
TEXACO CANADA
DARLING B COMPANY
R.L. HEARN GENERATING STATION

▲ Point Source for all Emissions

● Air Quality Monitoring Stations

2.1

Industrial Sources of Atmospheric Emissions

ATARATIRI
Environmental Evaluation Study Report

While the air quality measured at nearby monitoring stations indicates that there is potential to exceed some AAQC values, the air quality in the Ataratiri neighbourhood is not likely to be greatly different from other residential areas of Metropolitan Toronto.

2.4.2 Special Monitoring Surveys

Special monitoring surveys have been conducted in the vicinity of Ataratiri during the past few years. An intense monitoring survey of the South Riverdale area was conducted by the MOE during May and June of 1986 using the Mobile Air Monitoring Unit (MAMU). The study attempted to identify and quantify sources of odours reported in the area. Emphasis was placed on measurements downwind of Lever Brothers, Rothsay/Maple Leaf Mills, Canadian Oil, Darling and Company, Colgate-Palmolive, A.R. Clark & Company, and the Metropolitan Toronto Main Sewage Treatment Plant. The survey looked for 125 specific volatile organic compounds (VOCs) and ten other common pollutants (mostly inorganic compounds).

While MOE staff were able to perceive odours in the general region, the specific compounds causing these odours generally could not be determined. The exception was the identification of ammonia and amines in the vicinity of A.R. Clark & Company in concentrations sufficient to exceed the odour threshold for these compounds. For those parameters with MOE air quality standards, criteria, or guidelines, non-complying concentrations were not measured.

A survey of VOCs was undertaken by Environment Canada in 1987 to determine ambient concentrations in the urban environment in Canada. Two of the sites were located in Toronto: one at Queen's Park and the other in Leaside. Mean total concentrations at the two Toronto sites were similar to one another and not greatly different from the mean concentrations measured at a rural site in Stouffville.

2.4.3 Provincial Complaint Records

Monthly summary records of air quality complaints filed with the MOE for the South Riverdale area of Toronto were reviewed for the period January 1985 to April 1989. These records include the number and type of complaints, number of incidents, number of complainants, and where possible, the source responsible for the complaint. The majority of the nearly 2,000 complaints were due to odour. The greatest number of complaints occurred during the summer when residents are more likely to be outdoors and have windows open. The most frequently cited odour sources included Colgate-Palmolive, Darling and Company, Rothsay/Maple Leaf Mills, the Metropolitan Toronto Main Sewage Treatment Plant, and Lever Bothers (see Figure 2.1).

Based on several types of information, including complaint records, the MOE has been able to estimate "spheres of influence" for specific sources of odours in the vicinity of Ataratiri. The spheres of influence for several industries have been estimated to extend into the Ataratiri neighbourhood: Canada Packers, Canada Malting Company, Canadian Oil Company, Rothsay/Maple Leaf Mills, Lever Brothers, Victory Soya Mills, and Wickett and Craig.

Three of these industries, Canada Packers, Rothsay/Maple Leaf Mills, and Wickett and Craig will be closed or relocated as part of the redevelopment of Ataratiri. The Canada Malting Company has ceased the operations which were the source of the odorous emissions. Lever Brothers and Victory Soya Mills have undertaken control measures to alleviate odorous emissions.

The spheres of influence for three additional sources, Colgate-Palmolive, Darling and Company, and the Metropolitan Toronto Main Sewage Treatment Plant, do not reach Ataratiri but may be potential sources of complaints. If the Canadian Oil facility re-opens as planned, it too could be a source of odours at Ataratiri.

2.5 Industrial Emissions

2.5.1 Inventory of Industrial Emissions in the Vicinity of Ataratiri

To assess the types and amounts of atmospheric emissions emitted from industrial activities in the vicinity of Ataratiri, information was gathered from the MOE, the City, and some of the local industries. In addition, a survey was made of the site and surrounding area. Table 2.1 lists the industrial sources of emission located within the Ataratiri boundaries. Table 2.2 lists those industries in the surrounding areas which are of potential concern because they are close to Ataratiri or have emissions that could reach Ataratiri.

Tables 2.1 and 2.2 also include brief descriptions of the potential pollutants expected from each industry. Common pollutants such as CO, SO_2, NO_x, THC, and TSP are emitted by almost any process which involves the combustion of fuels or other high temperature processes and, therefore, are not included on the tables unless the source is a major emitter of these pollutants.

The measurement and evaluation of non-traditional pollutants (air toxics and odorous compounds) are relatively recent undertakings and, therefore, little information is available. Of the sources in the vicinity of Ataratiri, comprehensive toxics emission data are available only for the Metropolitan Toronto Main Sewage Treatment Plant (STP). Lead emission data are only available for Canada Metals. Table 2.3 lists non-traditional substances that could be released from the types of industries that operate in the vicinity of Ataratiri. The inclusion of a substance in the list does not necessarily mean that it is emitted from specific sources in the Ataratiri area.

The MOE recently compiled an inventory of atmospheric emissions to model air quality in the East Bayfront/Port Area just south of Ataratiri (Shenfeld *et al.*, 1991). The MOE recommended that this inventory be adapted for studying conditions at Ataratiri. The inventory was supplemented with information provided by the City and local industries. The average emission rates are presented in Table 2.4. In addition to emission rates, stack characteristics such as stack height, stack diameter, exit gas temperature and velocity were compiled for use in the mathematical modelling of the emissions.

2.5.2 Method Used to Assess Industrial Emissions

Two mathematical models have been used to simulate the effects of industrial emissions on air quality at specific locations across the Ataratiri site. The two models are the Multisource Gas model (GAS) and Worst Case Model (WCM), both of which are scheduled to be regulatory models under the Clean Air Program (CAP) proposed by the MOE.

The GAS model is designed to simulate the atmospheric dispersion of pollutants from multiple sources in urban settings. For Ataratiri, the GAS model was used to model concentrations of CO, NO_x, SO_2, and TSP at 45 receptor locations each assumed to be 1.5 m above ground surface (breathing zone). Input data for the model included the MOE emission inventory rates listed in Table 2.3. To the model results were added the "background" concentrations of contaminants. For Ataratiri, annual average concentrations measured by the MOE at a station in Stouffville were used as background (Shenfeld *et al.*, 1991).

The WCM model is used to calculate the worst case or highest concentrations of atmospheric contaminants that individual sources can cause under various weather conditions. The maximum concentration generated by the WCM model may actually occur infrequently, and, therefore, the model is used primarily as a screening tool. For Ataratiri, the WCM model was used to predict concentrations of contaminants for five heights: 1.5 m above grade (breathing zone), 25 m (sixth floor of a building), 50 m above grade (twelfth floor), 75 m (eighteenth floor), and 100 m (twenty-fourth floor).

2.5.3 Results Produced by the GAS Model

The results produced by the GAS model (including background) are summarized in Table 2.5. The results for carbon monoxide and sulphur dioxide are well below the appropriate AAQC.

Table 2.1

INDUSTRIAL SOURCES OF EMISSIONS WITHIN ATARATIRI

Name of Source	Nature of Source	Potential Pollutants
Alpine Foods	food distributor	odours
Athens Auto Body	auto repair/paint	odours, VOCs, auto exhausts
Auld York Cars	auto repair/service	odours, VOCs, auto exhausts
Canada Rag and Metal Inc.	metal scrap yard	dust, metal particulate matter
Cherry Mill Iron and Metal Co. Ltd.	metal scrap yard	dust, metal particulate matter
CN	transport services	diesel exhausts, dust
CNR	transport services	diesel exhausts, dust
Cummings Auto Body Ltd.	auto/truck repair	odours, solvents, vehicle exhausts
Fairway Auto	auto sales/service	odours, VOCs, auto exhausts
Fluid Express Lines	transport services	diesel exhausts, dust
Herman Motors	auto service	odours, VOCs, auto exhausts
Levis Paper Fibres	paper recycling	dust, paper

Table 2.1 (continued)

INDUSTRIAL SOURCES OF EMISSIONS WITHIN ATARATIRI

Name of Source	Nature of Source	Potential Pollutants
Matchless Auto Body	auto repair/paint shop	odours, VOCs, auto exhausts
McCord & Co.	ready mix concrete	dust
Mill Paper Fibres Ltd.	paper recycling	dust, paper
Schener Cherry Mill Terminal	rail/truck transfer depot	diesel exhausts, dust
Spanner & Co.	taxidermist	odours, VOCs
Star Automatic Transmission	auto service/repair	odours, VOCs, auto exhausts
The Body Shop	auto repair/paint shop	odours, VOCs, auto exhausts
Weston Foods	food processing	odour
Wickett and Craig Ltd.	leather tanning and finishing	odour, VOCs
Wolfe Iron and Metal	metal scrap yard	dust, diesel exhausts
XL Service Station	auto service/repair	odours, VOCs, auto exhausts

Table 2.2

INDUSTRIAL SOURCES OF EMISSIONS IN THE VICINITY OF ATARATIRI

Name of Source	Nature of Operation	Potential Pollutants
Canada Metals	lead recycling	lead particulate, dust, SO_2
Canadian Oil Co.	oil recycling	VOCs, odour
Colgate-Palmolive Canada	detergent and soap manufacturing	odour, acid fumes, dust
Darling and Co.	rendering	odour
Lake Ontario Cement	cement handling	fugitive dust
Lever Brothers Ltd.	detergent and soap manufacturing	odour, SO_2, dust
Metro Toronto Main STP	sewage sludge incineration and ash storage	odour, VOCs, dust, CO, NO_x
Paperboard Industries	paper manufacture	fugitive dust
Redpath Sugar	sugar refinery molasses	dust, odour
Rothsay/ Maple Leaf Mills*	rendering	odours
Texaco-Oil Distributing	oil distribution	VOCs, diesel exhausts
Victory Soya Mills	soya bean handling and pressing	odour, dust
Ontario Hydro Lakeview Generating Station	power production	SO_2, NO_x

Note:
* Operation will cease before Ataratiri is redeveloped.

Table 2.3

POTENTIAL POLLUTANTS EMITTED BY INDUSTRIAL PROCESSES

Industrial Process	Potential Emissions
Soap and Detergent Manufacturing	benzene, ethylene dichloride, ethylene oxide, formaldehyde, hydrogen sulphide, toluene, methyl methacrylate, detergent enzyme, arsenic, boron, polycyclic organic matter, morpholine
Paper Manufacturing	chloroform, chlorine, toluene, arsenic, cadmium, hydrogen sulphide, trichloroethylene
Petroleum Terminal	tetrahydrofuran, styrene, methyl methacrylate, hydrochloric acid, ethylene dichloride, formaldehyde, gasoline vapours, chlorine, carbon tetrachloride, ethylene dibromide, xylene, benzene, benzyl chloride
Secondary Lead Smelting	lead, arsenic, manganese, selenium, polycyclic organic matter
Sewage Sludge Incineration	polycyclic organic matter, mercury, arsenic, beryllium, cadmium, nickel, chromium, manganese, lead, copper, methyl chloride, ethyl chloride, vinyl chloride, acetonitrile, selenium, hydrogen chloride, phenols,

Table 2.4

AVERAGE INDUSTRIAL STACK EMISSIONS USED IN THE GAS MODEL

	Average Emission Rates (g/s)			
Source	for SO_2	for NO_x	for CO	for TSP
Canada Malting	0.75	0.57	0.02	0.614
Canada Metals	22.7	0.30	0.02	2.59
Colgate-Palmolive	nil	0.44	0.11	0.04
Darling and Company	nil	1.50	nil	nil
Lever Brothers Ltd.	0.02	0.82	0.24	0.51
Metro Toronto Main STP	0.44	2.74	nil	0.0165
Redpath Sugar	0.0269	2.87	0.13	0.38
Texaco Canada	3.05	1.34	0.04	1.0
Victory Soya Mills	0.56	0.76	0.17	2.42
Lakeview Thermal Generating Station	840	253	7.65	18.0

Note:

Emission rates provided by the Meteorology Section, Air Resources Branch, MOE.

Table 2.5

SUMMARY OF GAS MODEL PREDICTIONS

Time Frame	Maximum Predicted Concentration	AAQC[1]
Carbon Monoxide (CO)		
1-hour	10,122 μg/m^3	36,200 μg/m^3
24-hour	3,474 μg/m^3	not established
annual average	1,192 μg/m^3	not established
Sulphur Dioxide (SO_2)		
1-hour	154 μg/m^3	690 μg/m^3
24-hour	64 μg/m^3	275 μg/m^3
annual average	19 μg/m^3	55 μg/m^3
Nitrogen Dioxide (NO_2)		
1-hour	159 μg/m^3	400 μg/m^3
24-hour	55 μg/m^3	200 μg/m^3
annual average	18 μg/m^3	not established
Total Suspended Particulate Matter (TSP)		
1-hour	1,834 μg/m^3	not established
24-hour	540 μg/m^3	120 μg/m^3
annual geometric mean	90 μg/m^3	60 μg/m^3

Note:

1 - MOE ambient air quality criteria

The MOE has not established AAQC for nitrogen oxides but the predicted concentrations can be translated into concentrations of NO_2 by assuming that a portion of the NO_x is converted to NO_2. Studies have shown that this occurs at a rate of about 10 to 15% per hour under sunny conditions (Innes, 1981). The values in Table 2.5 reflect an NO_x:NO_2 ratio of 10:1. The results for NO_2 are all well below the appropriate AAQC.

The maximum 24-hour concentrations and annual geometric mean concentrations of TSP are predicted to exceed the AAQC. Given that non-complying TSP concentrations are measured frequently at all monitoring stations in Metropolitan Toronto, this result is not unexpected; however, the GAS model does not account for the loss of particulate matter through deposition (settling) or washout, therefore, the predicted concentrations likely overestimate actual conditions.

2.5.4 Results Produced by the WCM Model

The WCM model was used to assess the possible impacts of three sources: Canada Metals (a source of particulate lead); the Metropolitan Toronto Main STP (a source of numerous organic and inorganic pollutants); and, the Ontario Hydro Lakeview Generating Station (a source several kilometres west of Ataratiri but with tall exhaust stacks). These three sources were evaluated individually.

For Canada Metals, the WCM predicts a maximum 1-hour concentration of lead of approximately 0.5 $\mu g/m^3$ at the receptor height of 1.5 m and 5 $\mu g/m^3$ at the height of 100 m. There are no short-term AAQC for lead. The 24-hour AAQC is 5 $\mu g/m^3$.

Seventy-seven organic compounds that have been emitted by the Metropolitan Toronto Main STP were modelled. For most of these compounds, there are no AAQC. None of the predicted, 1-hour concentrations exceed the 24-hour AAQC that exist.

The WCM results for the Lakeview Generating Station suggest that the 1-hour AAQC could be exceeded for NO_2 and SO_2 under certain atmospheric conditions; however, conditions imposed by the MOE on station operations would likely prohibit such concentrations from occurring.

2.6 Road and Rail Traffic Emissions

2.6.1 Inventory of Road and Rail Traffic Emissions

The Ataratiri site is bordered and crossed by major transportation corridors. These consist of roadways such as the Gardiner Expressway, Lakeshore Boulevard, the Don Valley Parkway, the Eastern Avenue Diversion, Bayview Avenue, and Cherry Street. To the south and east of the site, there are two railway lines handling both freight and passenger trains.

The emissions associated with road and rail traffic include NO_x, CO, the non-methane fraction of total hydrocarbons, and TSP. While these sources have been included in the inventory used for the GAS model and, therefore, contributed to the predicted concentrations described in Section 2.5, a separate assessment of these sources also was undertaken as part of the evaluation of road and rail traffic impacts on air quality.

Sources of roadway traffic volume data are the same as those described in Chapter 7. To estimate the emissions from roadway traffic, the peak hour morning traffic volumes were used for 1990 and for 2010.

The MOBILE-3 model was used to calculate the emissions from each roadway segment. For gaseous pollutants, this model takes into account traffic mixtures (cars, trucks, etc.), vehicle fleet age distribution, operating conditions, and environmental conditions. TSP emissions from a roadway are represented by a single emission factor. The majority (>90%) of these emissions are from re-suspended roadway dust with minor contributions from tailpipe exhaust and tire wear. Because the phase-out of lead in gasoline was completed in 1990, lead was not considered as a vehicle emission.

Sources of rail traffic data are also the same as those outlined in Chapter 7. Information was obtained for 1990 and 2010. Emissions were calculated using emission data from the General Motors F59 locomotive as representative of the entire locomotive fleet.

2.6.2 Method Used to Assess Road and Rail Traffic Emissions

The emissions estimated using the MOBILE-3 model for roadway traffic were used as inputs for the HIWAY-2 model which is designed specifically to simulate short-duration (typically 1 hour) concentrations of pollutants emitted from linear sources such as roadways and rail lines. The model was run for a worst case situation which is characterized by limited dispersion conditions that can be typical of the morning rush hour. Concentrations of pollutants were calculated for the years 1990 and 2010 at locations throughout Ataratiri at a height of 1.5 m above ground level.

The HIWAY-2 model is limited by its inability to simulate the effects of building sizes, shapes, and locations on air pollution patterns. The predicted concentrations are thus only representative of the general effects of road and rail traffic on air pollution levels. The model also can not account for deposition processes and, therefore, overestimates TSP concentrations.

2.6.3 Results Produced by the HIWAY-2 Model

Table 2.6 summarizes the results of the HIWAY-2 model. The predicted 1-hour concentration for CO in 1990 is well below the AAQC. For the Year 2010, the effects of increasing traffic volume and decreasing tailpipe emissions are predicted to result in a net increase of 36% in maximum predicted CO concentrations; however, the predicted concentrations still remain below the 1-hour AAQC. The contributions of rail traffic to the maximum CO levels are trivial and, therefore, are not included in the concentrations shown in Table 2.6.

The predicted concentrations of SO_2 from rail traffic for the Years 1990 and 2010 are well below the AAQC. Road traffic emissions are estimated to be trivial and, therefore, are not included in the predicted concentrations.

The predicted concentrations of NO_2 from road and rail traffic for the year 1990 are well below the AAQC. At the location with the highest predicted concentration, rail traffic emissions are estimated to contribute less than 1% of the total concentration.

The predicted concentrations of NO_2 in the Year 2010 from road traffic are influenced by lower emission rates from newer cars and a higher volume of traffic. The net effect of these two factors is that the concentrations of NO_2 are predicted to increase by 39 to 57% with maximum concentrations slightly in excess of the current AAQC of 400 $\mu g/m^3$.

The maximum 1-hour concentrations of TSP are predicted to be 1,050 $\mu g/m^3$ for 1990 and 1869 $\mu g/m^3$ for 2010. These can be extrapolated to 24-hour concentrations of 300 and 400 $\mu g/m^3$ range, well above the AAQC of 120 $\mu g/m^3$. Total concentrations would be even higher if a background concentration was added, but it must be remembered that the HIWAY-2 model does not take into account any of the various ways that remove TSP from air. The results, therefore, likely overestimate actual concentrations. In addition to the limitations of the model, redevelopment of Ataratiri will remove some fugitive sources of TSP by reducing the extent of open unpaved parking areas and industrial yards.

The peak concentrations of non-methane hydrocarbons are predicted to be approximately 1,000 $\mu g/m^3$. A slight decrease is predicted by 2010 due to reduced emissions from future automobiles. Criteria have not been established for this parameter. Railway traffic is a very small contributor to non-methane hydrocarbons and was not included.

2.7 Summary of Air Quality at Ataratiri

The mathematical modelling, the review of air quality data collected at stations near Ataratiri, and the review of MOE complaint records indicate that four aspects of air

Table 2.6

SUMMARY OF HIWAY-2 MODEL PREDICTIONS

Time Frame	Maximum Predicted Concentration	AAQC[1]
Carbon Monoxide (CO)		
1-hour (in 1990)	23,221 $\mu g/m^3$	36,200 $\mu g/m^3$
1-hour (in 2010)	$\approx$ 27,000 $\mu g/m^3$	36,200 $\mu g/m^3$
Sulphur Dioxide (SO_2)		
1-hour (in 1990)	13 $\mu g/m^3$	690 $\mu g/m^3$
1-hour (in 2010)	16 $\mu g/m^3$	690 $\mu g/m^3$
Nitrogen Dioxide (NO_2)		
1-hour (in 1990)	376 $\mu g/m^3$	400 $\mu g/m^3$
1-hour (in 2010)	419 $\mu g/m^3$	400 $\mu g/m^3$
Total Suspended Particulate Matter (TSP)		
1-hour (in 1990)	1,050 $\mu g/m^3$	not established
1-hour (in 2010)	1,869 $\mu g/m^3$	not established
Non-Methane Hydrocarbons		
1-hour (in 1990)	1,116 $\mu g/m^3$	not established
1-hour (in 2010)	968 $\mu g/m^3$	not established

Notes:

1 - MOE ambient air quality criteria

Predicted maximums of CO, NO_2, TSP, and non-methane hydrocarbons do not include rail traffic which would be a very small contributor. Predicted maximums of SO_2 do not include road traffic which would be a very small contributor.

quality are most likely to be of concern at Ataratiri: TSP, NO_2, ozone, and odours.

TSP concentrations in excess of the AAQC have been measured at stations near Ataratiri. Furthermore, mathematical models predict that non-complying concentrations of TSP will continue at Ataratiri in the future. A portion of the measured and predicted levels of TSP is attributed to activities previously or currently underway within Ataratiri. Once the redevelopment of Ataratiri has been completed, a substantial portion of these local emission sources will be eliminated by the removal of industrial sources and the covering of open areas with grass and buildings. Nevertheless, common urban activities may still result in the AAQC being exceeded.

Concentrations of NO_2 measured at the Sherbourne/Wilton station do not exceed the AAQC; however, the mathematical models show that NO_2 concentrations could exceed AAQC under conditions of poor dispersion and high traffic emissions. Automobiles are a major source of nitrogen oxides and the AAQC is frequently exceeded in urban areas.

The air quality monitoring data from the Sherbourne/Wilton station indicate that the AAQC is likely exceeded for ozone at Ataratiri. Ozone is a regional problem and the Ataratiri neighbourhood is no worse than other areas in southern Ontario. In fact, the 1-hour AAQC is exceeded less often at the Sherbourne/Wilton station than at many other locations in southern Ontario.

Odours are expected to be a potential concern based on complaints received by the MOE in recent years.

The modelling of future air quality indicates that the highest levels of pollutants emitted by traffic are likely to be highest in the vicinity of the northern border of the site between Parliament and St. Lawrence Streets.

There are several factors that can not be taken into account by reviewing existing information or using mathematical models but which could strongly influence long-term changes in future air quality at Ataratiri. Many of these factors suggest that future air quality is likely to be much better than that predicted by the models:

- The Clean Air Program proposed by the MOE is likely to require improved levels of emission controls resulting in lower levels of many pollutants.

- Actions by governments, developers, and citizen groups to remove sources of emissions which are incompatible with residential, commercial and recreational use will likely improve local air quality. Such actions have already resulted in the removal of several potential odour sources from the area.

- Further regulations on vehicular traffic are likely to reduce emissions of carbon monoxide, nitrogen oxides, and hydrocarbons. There may also be a greater percentage of the population using public transportation.

- Some industries have taken actions to reduce their adverse impacts on local air quality. For example, many industries have switched to cleaner burning fuels, or have installed more effective pollution control equipment.

While the above factors could improve long-term air quality at Ataratiri, there is also the potential for concentrations of some pollutants such as TSP and organic vapours to increase during the period of site clean-up and redevelopment. Most soil and ground water clean-up methods, as well as conventional soil excavation and haulage activities, have some potential to emit contaminants into the atmosphere. As a result, various site activities will need to address air quality issues. (Chapters 4 and 5 describe the clean-up activities being considered for Ataratiri.) Air quality issues for remediation workers and Ataratiri neighbours during clean-up are discussed in Section 2.8.

2.8 Human Health Aspects of Air Quality

2.8.1 Concerns for Future Site Users

Previous sections identify three specific air quality contaminants that have the potential to exceed provincial criteria at Ataratiri: TSP, nitrogen dioxide, and ozone. Odours are not included in this discussion of health concerns; however, there is some information available concerning the related aspect of "air toxics" (organic compounds including VOCs and hydrocarbons). The potential implications of each of these aspects is discussed in the *Health Risk Issues Study of the Air, Soil and Ground Water at the Ataratiri Site* (CanTox, 1991a).

TSP concentrations in excess of the AAQC have been measured near Ataratiri; however, actual health consequences from the actual particles are not expected until concentrations reach levels such as the nuisance dust criterion of 10,000 $\mu g/m^3$ (ACGIH, 1989). If dust particles have substances adsorbed onto them such as metals or organic compounds such as polycyclic aromatic hydrocarbons (PAHs), increased human health concerns can occur at lower levels than the nuisance criterion.

Measurements of metals in dust samples collected near Ataratiri are well below the provincial AAQC. The available data suggests that the annual mean air concentrations of lead associated with TSP have decreased by more than two-fold between 1983 and 1987, possibly reflecting the increased use of non-leaded gasoline. Based on a preliminary assessment of the exposure from breathing air containing the highest annual average concentration of lead in TSP measured in the vicinity of Ataratiri, there does not appear to be excessive exposures resulting from lead associated with TSP.

Measurements of other substances adsorbed to TSP are relatively scarce and usually only collected during special studies. While establishing one or more monitoring stations in the vicinity of Ataratiri would allow the health risks of TSP to be evaluated for future residents of Ataratiri and adjacent areas, the health concerns related to such exposures are not expected to be different for Ataratiri than urban areas in general.

Published information on potential adverse health effects associated with nitrogen oxides in air indicate that no adverse effects would be expected at daily NO_2 concentrations in the range of 100 to 200 $\mu g/m^3$; however, some of the concentrations predicted for Ataratiri exceed that range. If the predicted concentrations are correct, undesirable health consequences (such as respiratory irritation, coughing, and congestion) could be expected in sensitive individuals.

While maximum 1-hour concentrations of ozone exceed the AAQC at stations near Ataratiri, annual average values are almost a factor of ten lower, indicating that most measurements of 1-hour concentrations are well below the AAQC. Therefore, no long-term health consequences are expected. At the highest concentrations measured at the Breadalbane station, the only expected effects would be slight respiratory irritation in sensitive individuals.

Very little information is available concerning potentially toxic chemicals in the air in the vicinity of Ataratiri. Measurements taken near major sources did not exceed guidelines and emissions from those sources likely would be subject to more dilution at Ataratiri than at the monitoring locations. In addition, several of the industrial sources of air emissions in the vicinity of Ataratiri will be removed when the site is redeveloped.

Air quality at Ataratiri is likely similar to that in other Metro Toronto neighbourhoods, therefore, the potential air quality concerns identified for Ataratiri are common to most urban settings.

2.8.2 Concerns Relating to Remediation Workers

The major air quality concerns of workers conducting the soil and ground water remediation programs (see Chapters 4 and 5) would relate to the inhalation of vapours, dust particles, and the chemicals that may be attached to dust particles. Potential exposures to volatile chemicals could occur in areas of the Ataratiri site where these chemicals are detected at elevated concentrations in the soils or ground water. Another air quality concern for remediation workers would relate to the potential exposure to solvents and/or chemicals used in some of the remediation procedures.

Air quality concerns can be resolved through the use of proper protective equipment/clothing, adequate occupational health and safety monitoring and inspection, and the operation of an adequate health and safety program at the site. There may be a requirement to develop programs specific to the unique occupational health and safety issues for particular soil or ground water remediation procedures. These issues are addressed in greater detail in Chapters 4 and 5.

2.8.3 Concerns to Neighbouring Sites During Remediation

The major air quality concerns to residents of neighbouring sites during the soil remediation relate to potential exposures to chemicals associated with soil dusts, and possibly to volatile chemicals that can be released. Ways to minimize the dust and vapours produced during remediation are described in Section 2.9.

2.9 Remedial Options and Strategies for Air Emissions

As noted in Section 2.7, the four aspects of air quality most likely to be of concern to future site users are TSP, NO_2, ozone, and odours. The ability of activities in and around Ataratiri to remediate or even influence the concentrations of these pollutants varies widely.

TSP is considered to be a potential air quality concern in both the present and the future. Local actions that can be used to reduce TSP levels include frequent street cleaning, and the planting of trees and shrubs along transportation corridors.

Ozone levels are largely the result of emissions that occur far from Ataratiri, and, therefore, local control measures are not applicable. Likewise, a large proportion of the NO_2 levels are largely the result of emissions beyond the control of local planning actions or initiatives.

Based on the number of complaints received from residents of nearby neighbourhoods, odours could be a concern at Ataratiri. Many of the possible sources of odour will have been eliminated before the redevelopment of Ataratiri is completed; however, if problems are experienced, the MOE may require further controls on the source(s). Land use planning and zoning restrictions can be used to reduce the potential for odour problems.

As noted in Section 2.8.3, strategies to control atmospheric emissions will need to be established for soil and ground water remediation activities at Ataratiri as well as for conventional soil excavation and haulage activities. It is anticipated that these strategies will consider truck tire washing facilities, the use of tarpaulins on trucks, and moistening soils at work faces. Any volatile chemicals used during remediation will need to be kept covered or used in enclosed areas.

Air quality monitoring at locations around the perimeter of the site or possibly at off-site locations during remediation of the site may be needed. A community awareness program could help in informing neighbours about air quality issues and lessen concerns. Air quality issues for Ataratiri neighbours and remediation workers are also discussed in Chapters 4 and 5.

Reducing vehicle volumes through traffic control strategies and public transit improvements are possible ways to reduce emissions that could benefit Ataratiri and the City as a whole. For example, the Toronto Transit Commission has agreed to provide bus service along Front Street to link Ataratiri to the Financial District and other employment centres.

Ataratiri offers opportunities to provide improved facilities for the leisure and commuter cyclists. Integrated bicycle lanes are to be included on Front Street, Mill Street, and the proposed southern extension of River Street (A.J. Freedman Associates, 1990). There are also opportunities to connect Ataratiri bicycle routes into the regional system. The Lower Don Path is an important route for recreational and commuter cyclists as well as walkers and joggers. It is proposed to connect Ataratiri to the Lower Don Path by providing a path at the southeast corner of the site. Another bicycle and pedestrian connection could be provided at the west end of Mill Street into David Crombie Park. Although there is no space for special bicycle lanes. Parliament Street and Cherry Street will be important routes to the Martin Goodman Trail and the recreation areas at Queen's Quay East and Cherry Beach.

2.10 Recommendations for Further Studies

Given that air quality has not been monitored at Ataratiri, remediation activities on the site will be potential sources of emissions, and various changes associated with redevelopment of the site will influence local air quality, several aspects of future air quality are candidates for further study:

- It is recommended that an air quality monitoring program be established in the vicinity of Ataratiri once redevelopment is complete. This program should include continuous monitoring for the more common pollutants of concern (i.e., NO_x, O_3 and TSP), as well as toxic substances and odours.

- The sizes, shapes, and locations of buildings can create localized areas where pollutant concentrations are elevated. Various types of mathematical models and physical models (such as those studied in wind tunnels) can be used to study whether such conditions might be created at Ataratiri. One possible area of concern is in the vicinity of the northern border of the site between Parliament and St. Lawrence Streets which the models used to date indicate may experience high concentrations of contaminants emitted by traffic. The information produced by the models could be used to refine building details such as the location and design of air intakes. Wind tunnel models can also be used to determine if or where wind speeds uncomfortable for people outside might be experienced at the site.

- As part of the process of finalizing soil and ground water remediation strategies at Ataratiri, emissions and the resulting air concentrations should be estimated. This type of information may be available from the published literature but a preferred source would be to take measurements during laboratory or pilot scale tests of remediation options.
- Air quality should be monitored while remediation is underway to ensure that workers and site neighbours are not exposed to unacceptable levels of emissions.

3.0 NOISE AND VIBRATION

3.1 Overview

Many of the current industrial and commercial activities undertaken in and around Ataratiri are sources of noise and vibration. Redevelopment may eliminate or modify some of these sources or introduce new sources.

Condition 2 of the Ataratiri Exemption Order requires that key concerns associated with noise and vibration be addressed in this report. In response to that condition, the City retained Vibron Limited to address the following aspects of noise and vibration at Ataratiri:

- identify existing sources of noise and vibration of concern both on and off the site;
- estimate how the existing acoustic environment is likely to change in the future;
- identify existing and future noise and vibration impacts on the proposed development; and
- suggest ways to reduce adverse noise and vibration impacts to acceptable levels.

This chapter summarizes the findings of the Vibron report (1990) and a report addendum (1991). It identifies the criteria and guidelines that should be used to evaluate noise and vibration at Ataratiri, assesses existing conditions, predicts future noise and vibration levels, describes remedial options and strategies available, and recommends further studies that may be necessary as specific aspects of Ataratiri are being designed.

3.2 Relevant Criteria and Guidelines

3.2.1 Noise Guidelines for Residential Land Use

The two principal sources of noise guidelines for residential land use are those of the MOE and Canada Mortgage and Housing Corporation (CMHC). The MOE guidelines are likely to be directly applicable to the Ataratiri development and experience has shown that compliance with the guidelines results in comfortable living spaces and outdoor living areas. The CMHC limits tend to be slightly more restrictive; however, compliance with CMHC limits usually is required only when funding is contributed by that agency.

Both the MOE and the CMHC recommend sound guidelines according to room function and time of day. Both agencies define "daytime" as the 16-hour period between 7:00 am and 11:00 pm and "night-time" as the eight-hour period between 11:00 pm and 7:00 am.

Table 3.1 summarizes the acceptable indoor and outdoor sound level limits due to road and rail traffic noise established by the MOE for residential areas (MOE, 1989a).

When outdoor sound levels from transportation activities equal or exceed an equivalent sound level of 60 A-weighted decibels (abbreviated as 60 dBA, Leq) during the night-time and 65 dBA, Leq during the daytime, the MOE recommends that air conditioning be provided for residential units. Mechanical ventilation and the provision for the future installation of air conditioning are required if the noise level at the outside wall ranges from 55 to 60 dBA, Leq during the daytime or if it exceeds 50 dBA, Leq during the night-time. These provisions allow windows to be closed against noise in the summertime. While the provision of air conditioning can be used to control noise levels from transportation activities, the MOE does not consider air conditioning to be an acceptable way to control noises that originate from industrial sources.

Table 3.1 also includes the recommendations of the CMHC for sound level limits. In addition to its numerical recommendations, the CMHC has described the acceptability of sound levels as measured at the outside building facades of residential units:

less than 45 dBA	Acceptable - Noise exposure both indoors and outdoors is unobtrusive.
45 to 55 dBA	Normally acceptable - Noise exposure may cause some concern but construction complying with "Residential Standards" should provide acceptable indoor conditions.
55 to 75 dBA	Normally unacceptable - Noise exposure is significantly more severe. Indoor conditions are unacceptable unless adequate sound insulation is provided. Outdoor recreational space may have to be sheltered.
greater than 75 dBA	Unacceptable - Noise exposure is so severe that sound insulation costs would be prohibitive and outdoor environment would be excessively noisy.

3.2.2 Noise Guidelines for Retail and Commercial Land Use

The MOE has set an indoor sound level limit of 50 dBA, Leq during the daytime for general offices, reception areas, and retail shops and stores. The CMHC has recommended an indoor limit of 45 dBA, Leq during the daytime for retail and commercial uses.

Table 3.1

ACCEPTABLE INDOOR AND OUTDOOR SOUND LEVEL LIMITS

	Daytime		Night-time	
	CMHC	MOE	CMHC	MOE
outdoor living area	55	55	na	na
outside bedroom windows	na	na	na	50
bedrooms	na	na	35	40
living and dining rooms	40	45	na	na
kitchens and baths	45	50	na	na

Notes:

All values expressed as dBA, Leq.

na - not applicable

The term "outdoor living area" refers to areas such as an outdoor patio, backyard, children's play area, and parkland used for passive recreation.

3.2.3 Noise Guidelines for Industrial Land Use

In 1978, the MOE issued a model by-law that municipalities can use to control noise (MOE, 1978). In support of the model noise by-law, the MOE also has issued various publications which describe preferred methods for measuring and evaluating noise sources. Some of these publications are relevant to industrial activities such as Publication NPC-105, which applies to sound level limits for sound from stationary sources, and states that noise from industry measured at the property line of a residence cannot exceed the sound level existing in the area due to road traffic at any time. If a sound has a pronounced audible tonal quality such as a whine, screech, buzz or hum, the MOE recommends that a 5 dB penalty be added to the measured sound levels to account for increased negative reaction to sounds having tonal components.

The City of Toronto By-Law No. 44-75 prohibits the operation of equipment that raises the background or ambient sound level (also referred to as the L(90) sound level) within a receiving area by more than 2 dBA from the L(90) during any corresponding period of time of not less than one hour.

These guidelines are useful in assessing the allowable impact of off-site industrial sources. Generally, the MOE guidelines are slightly more stringent than those of the City because of the tonality penalty.

3.2.4 Noise Impact Assessment Requirements

The City of Toronto Department of Public Works and the Environment requires that a Class 3 noise impact assessment be prepared for each individual building in the development and submitted for review. These assessments must consider the impact of the development on the environment, the impact of the environment on the development, and the impact of the development on itself. Recommendations must be given for appropriate external facade constructions, adequate silencing of mechanical systems and internal constructions for the reduction of noise transmission between sites.

3.2.5 Vibration Guidelines

Vibration can be described as a flow of energy through the ground. As energy travels farther from its source, it decreases in strength at a rate which depends upon distance, soil conditions, and mode of transmission.

Vibrational energy can range from being barely perceived, to being annoying, or, in the extreme, causing structural damage. The levels of ground-borne vibrational energy near rail and street car lines are such that structural damage is unlikely, but it can be clearly perceptible and annoying in sensitive locations such as bedrooms. For these reasons, acceptable levels of vibration are based upon perceptibility. To date, the most sophisticated method of evaluating the perceptibility of vibration has been developed by the Canadian National Railroad (CNR). The MOE has adopted the same criteria in draft form but has not yet included them in official guidelines. The CNR approach is based on the assessment that vibrations with frequencies between 4 and 200 hertz have the potential to cause annoyance at a sensitive residential receptor location if the velocity of the vibration exceeds 0.14 mm/s during an averaging time of 1 second. Below this speed, vibration is not a concern; above it, consideration should be given to mitigation measures.

Stronger vibration levels are needed to produce annoyance or inconvenience in commercial or industrial areas than those which are perceptible at a sensitive residential location; however, there are no guidelines for acceptable ground-borne vibration levels in commercial or industrial spaces. If complaints arise, each situation is assessed individually according to the perceptibility of the vibration and the activities occurring in the space. Vibration levels due to passing trains generally do not cause concern in a commercial establishment unless equipment or industrial processes sensitive to vibration are being used.

3.3 Existing Noise and Vibration Levels

3.3.1 The 1989 Noise Monitoring Program

Noise monitoring was conducted during June and July 1989 to identify and measure sources of sound both on- and off-site. In addition to observations made during the site visits, three types of measurements were taken:

- Twenty-four hour ambient sound levels were measured at four locations to determine background (ambient) sound levels over the course of a day. Ambient sound levels can be used to determine if industries or mechanical equipment exceed criteria.

- Short-term (20 minutes) monitoring was conducted at road intersections to determine existing road traffic sound levels at specific locations. Although the design of building facades to protect against noise will be influenced by predicting future traffic noise levels (which are often higher than existing levels), existing levels are required for comparative purposes.

- Spectrum analysis (an analysis of the sound level at each frequency) was used to determine the tonal qualities of the sounds being emitted from several off-site industrial noise sources.

3.3.2 On-site Noise Levels

Figures 3.1 and 3.2 show the ambient daytime and night-time sound levels measured in 1989. The Leq(16) and Leq(8) represent average sound levels over the 16 hours of daytime and the 8 hours of night-time, respectively. Figure 3.1 shows that the daytime sound levels throughout the area ranged from 63 to 75 dBA. Figure 3.2 shows that night-time sound levels were 3 to 8 dBA lower than daytime sound levels. Both daytime and night-time sound levels exceeded the MOE guidelines for outdoor living areas and can generally be attributed to road and rail traffic noise that originates in and around the site.

Ambient, daytime sound levels along Parliament Street and Eastern Avenue were 70 dBA. The sound levels were approximately 72 dBA near the Eastern Avenue Diversion. Levels along King Street East were relatively high due to the proximity of the McCord concrete plant. A daytime sound level of 72 dBA was measured along the eastern boundary of Ataratiri adjacent to the Don Valley Parkway and the north-south railway corridor. A daytime sound level of 65 dBA was measured at the southeast corner of the site.

Short-term monitoring produced 20-minute Leq sound levels of 72 to 74 dBA, Leq during the daytime just south of the intersection of Front and Cherry Streets. Further east, south of the intersection of Front and Overend Streets, daytime sound levels ranged from 63 to 66 dBA.

3.3.3 Characteristics of On-site Sources

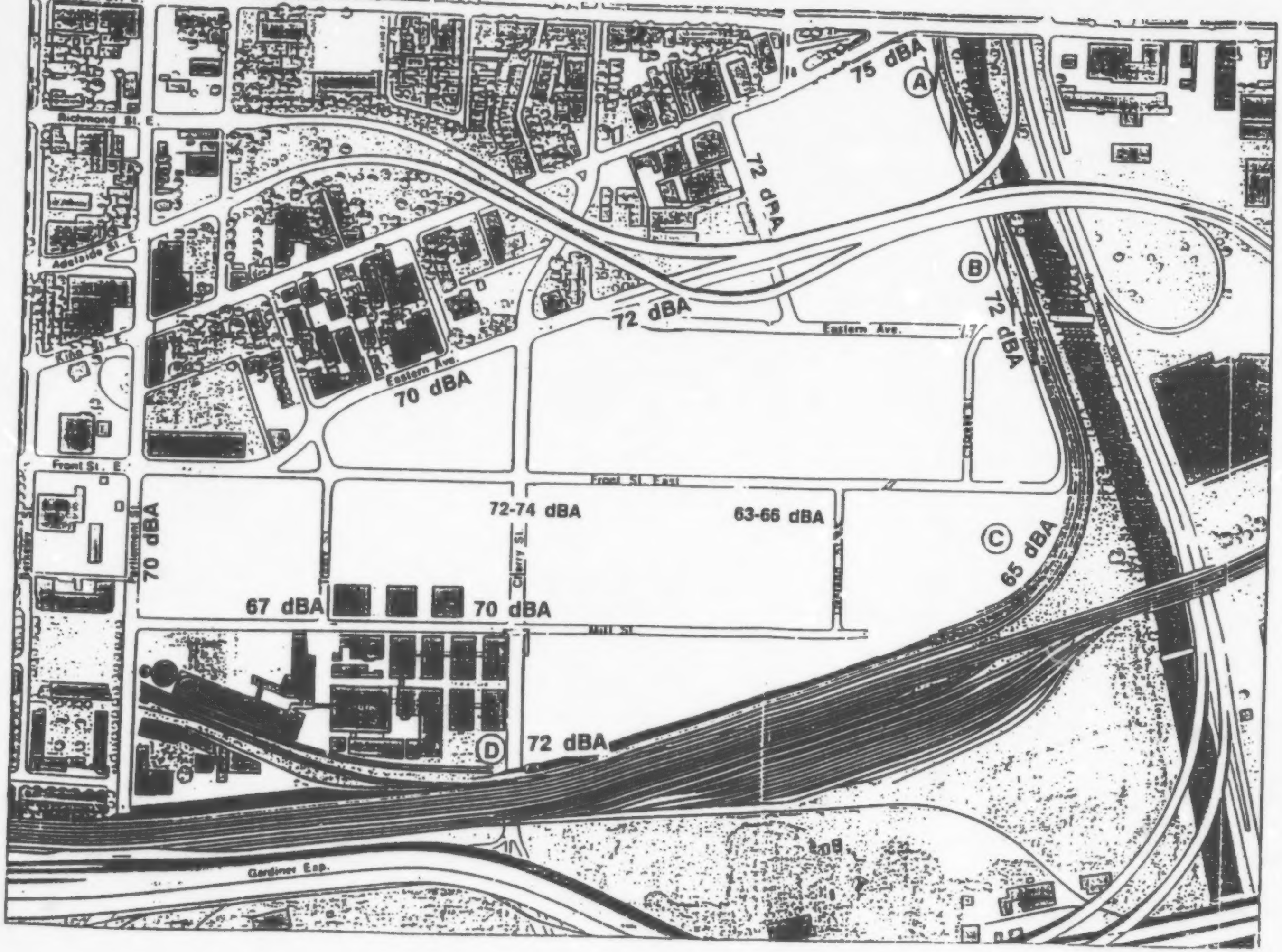
On-site sources of noise include road traffic and industrial activities. Table 3.2 lists on-site noise sources based on a reconnaissance of the Ataratiri area in 1989. Some of those sources have since ceased operations. All of the on-site, industrial noise sources will cease upon the redevelopment of Ataratiri.

The largest on-site source is road traffic. The major on-site roads (defined as those that pass through the site) include:

Bayview Avenue
Eastern Avenue
Front Street East
Cherry Street
Eastern Avenue Diversion

Traffic on Bayview Avenue and Cherry Street currently have large components of truck traffic (in part due to operations at the McCord concrete plant which is scheduled to leave the area by the end of 1991). Sources of the traffic data are the same as those described in Chapter 7.

Various industrial activities undertaken at Ataratiri are "point" sources of noise. These include the scrap metal yards located on Cherry Street and Front Street. Noises from the


Queen St. E
Richmond St. E
Adelaide St. E
King St. E
Front St. E
Parliament St.
Eastern Ave.
Eastern Ave.
Front St. East
Cherry St.
Mill St.
Gardiner Esp.
75 dBA
A
72 dBA
B
72 dBA
72 dBA
70 dBA
72-74 dBA
63-66 dBA
C
65 dBA
70 dBA
67 dBA
70 dBA
D
72 dBA

A - D 24 Hour Monitor Locations

3.1

Ambient Daytime Sound Levels

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Table 3.2

EXISTING ON-SITE NOISE SOURCES (AS OF 1989)

Roads	
Bayview Avenue	borders the site on the east side; currently utilized by a great deal of truck traffic from the McCord & Co. concrete plant located in the northeast corner of Ataratiri.
Cherry Street	a north-south road located on the western half of the site; currently heavily travelled and utilized by a large number of trucks
Eastern Avenue	borders the area west of Cherry Street and proceeds internally east of Cherry Street
Eastern Avenue Diversion	elevated section of roadway where Eastern, Adelaide Street, and Richmond Street merge; passes over northeast section of Ataratiri.
Front Street East	enters Ataratiri east of Parliament Street and eventually becomes Bayview Avenue on the east border
Industrial Activities	(All of these operations will cease before or during the redevelopment of Ataratiri.)
Scrap yards	located on Cherry Street and Front Street; noise sources include a crane and other impulsive noises associated with normal operations
Canada Packers	operations are located on the northeast corner of Cypress Street and Front Street and on the northwest corners of Mill Street and Overend Street; noise sources include loading bays, dust collectors and compressor inlets
Wickett and Craig	a leather goods manufacturer located between Cypress Street and Bayview Avenue north of Front Street East; noise sources include a fork lift truck, delivery truck and compressors
Levis Paper Fibres Company	a former paper recycling operation located on the north side of Eastern Avenue, west of Bayview Avenue; main source of noise was due to conveyors and fork lift trucks; closed in 1989
McCord & Co.	concrete plant located on the south west corner of King Street and Bayview Avenue; dominant source of noise is the associated truck traffic

scrap yards are due to cranes and other impulsive noise sources associated with normal operations. The yards will cease as part of the redevelopment of Ataratiri and, therefore, will not be a concern with respect to noise for future residents.

The operations of Canada Packers formerly were located south of Front Street and east of Overend Street. Noise sources present during the 1989 survey included loading bays, dust collectors, and compressor inlets. These operations have since ceased.

Wickett and Craig, a leather goods manufacturer formerly located east of Cypress Street and north of Front Street East. Noise sources during the 1989 survey included a fork lift truck, truck traffic during deliveries, and compressor noise. Since the survey, this operation also has ceased.

The Levis Paper Fibres Company formerly was located on the north side of Eastern Avenue, west of Bayview Avenue. The main source of noise from paper recycling operation was due to conveyors and fork lift trucks. Since the 1989 noise survey, this operation has ceased.

McCord & Co. is located on the southwest corner of King Street and Bayview Avenue. The dominant source of noise is the associated truck traffic. The concrete batching operations are scheduled to be relocated away from Ataratiri by the end of 1991.

3.3.4 Characteristics of Off-site Sources

Several off-site activities contributed to the noise levels observed at Ataratiri in 1989. The major sources of noise are due to road and rail traffic but several "point" sources also are present. Noise sources present in the surrounding area in 1989 are summarized in Table 3.3. As noted below, some of the operatons have since ceased and steps to reduce noise emissions were taken at one source.

Major off-site roads (including those that make up the site boundaries) include:

Adelaide Street East
Don Valley Parkway
Eastern Avenue
Gardiner Expressway
King Street (west of St. Lawrence Street)
Parliament Street
Queen Street East
Richmond Street East

The Don Valley Parkway and Gardiner Expressway carry large volumes of traffic and are major sources of noise in the general area. Road traffic noise from the Gardiner Expressway impacts the southern portions of Ataratiri, while the Don Valley Parkway impacts the eastern edge of Ataratiri.

Table 3.3

EXISTING OFF-SITE NOISE SOURCES (AS OF 1989)

Roads

Gardiner Expressway - located approximately 100 m from the southwest corner of Ataratiri and extends to 300 m at the southeast corner; elevated about 10 m above ground level

Don Valley Parkway - located approximately 80 m east of the eastern boundary of Ataratiri; depressed approximately 6 m below ground level

King Street East - represents a portion of the northern boundary

Queen Street East - passes near the northeast corner of Ataratiri

Eastern Avenue - represents a portion of the northern boundary west of Cherry Street

Parliament Street - represents the western boundary

Adelaide Street East and Richmond Street East - approach the area west of St. Lawrence Street then combine into the Eastern Avenue Diversion (see Table 3.2)

Rail Lines

Railway lines owned by CNR and CPR border Ataratiri on the south and east and are used by VIA, GO Transit, freights and switchers; noise sources are those associated with moving trains

Industrial Activities

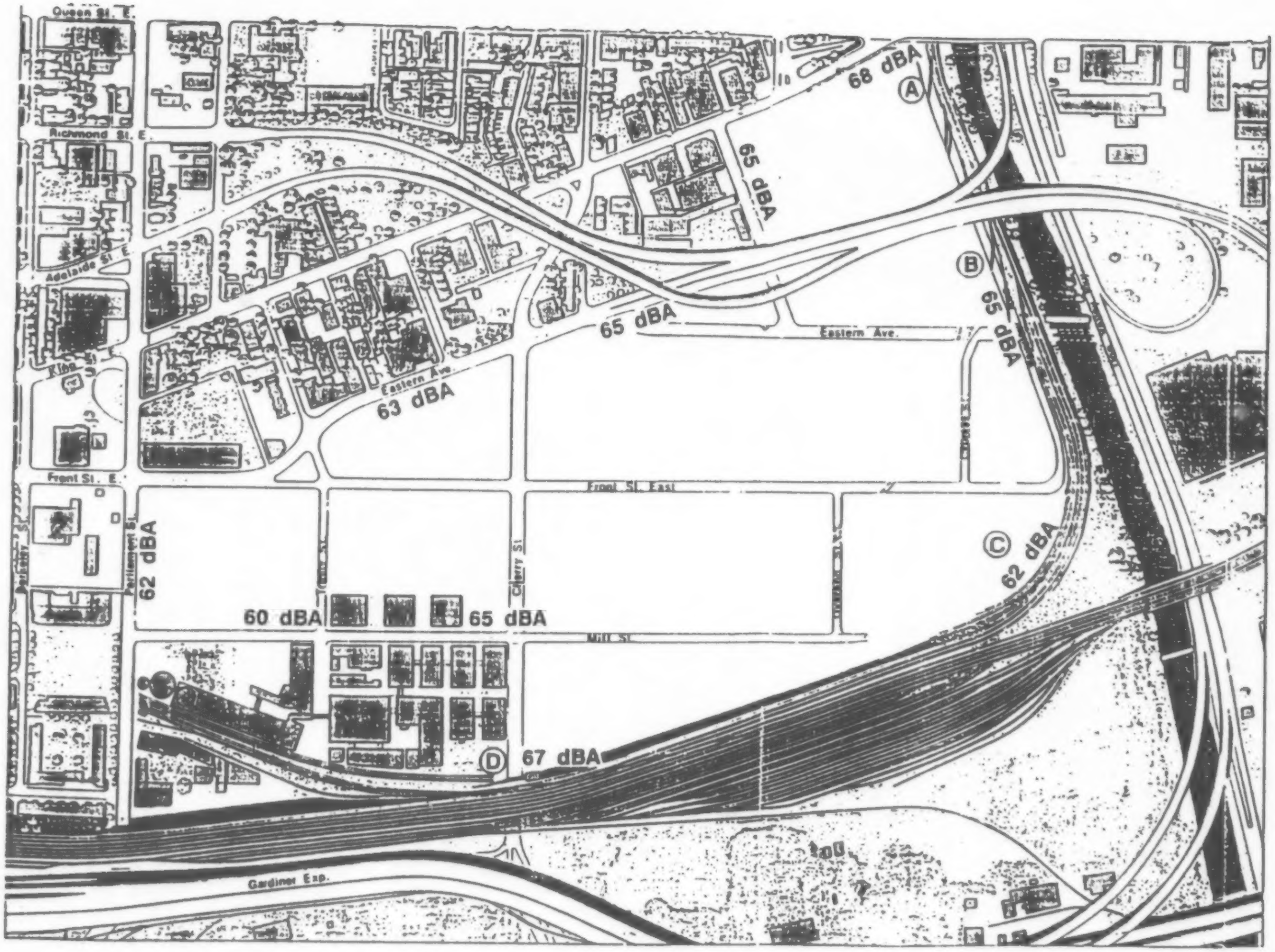
Lever Brothers - manufacturing plant located east of the Don Valley Parkway, approximately 230 m from the southeast corner of Ataratiri; noise sources include process or ventilation exhaust fans audible at various times through the day and night because it is a 24-hour operation

Gooderham & Worts - a distillery located on the south side of Mill Street between Trinity and Cherry Streets; noise sources include exhaust fans, public address systems, and lunch sirens

Rothsay/Maple Leaf Mills - rendering facility located south of the east-west railway lines approximately 300 m south of Ataratiri; exhaust fans were audible on a 24-hour basis

Don Sorting Yards - located directly south of Ataratiri; shunting activity, idling trains, and cabooses, screeching wheels and brakes, banging of cars when the trains stop and start, bells and horns, and loud speakers

Toronto Plating Company - located on the northeast corner of Eastern Avenue one street west of Cherry Street; two air conditioners on the east and south sides of the building


Queen St. E.
Richmond St. E.
Adelaide St. E.
King St. E.
Front St. E.
Parliament St.
Berkeley St.
Eastern Ave.
Front St. East
Cherry St.
Mill St.
Gardiner Exp.
68 dBA
Ⓐ
65 dBA
Ⓑ
65 dBA
65 dBA
63 dBA
62 dBA
Ⓒ
62 dBA
60 dBA
65 dBA
Ⓓ
67 dBA

A - D 24 Hour Monitor Locations

3.2

Ambient Night-time Sound Levels

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Off-site industrial operations were evaluated during the 1989 noise monitoring program by taking measurements at the nearest on-site locations for several of those sources. Gooderham & Worts is a former distillery located on the south side of Mill Street between Trinity Street and Cherry Street. Potential daytime noise sources observed in 1989 included exhaust fans, public address systems, and lunch sirens. Night-time sources included mechanical equipment. Noise resulting from exhaust fans was measured at 54 dBA at a location on Mill Street. The distillery operation at Gooderham & Worts has since closed and the site is being considered for commercial and residential redevelopment by its owners.

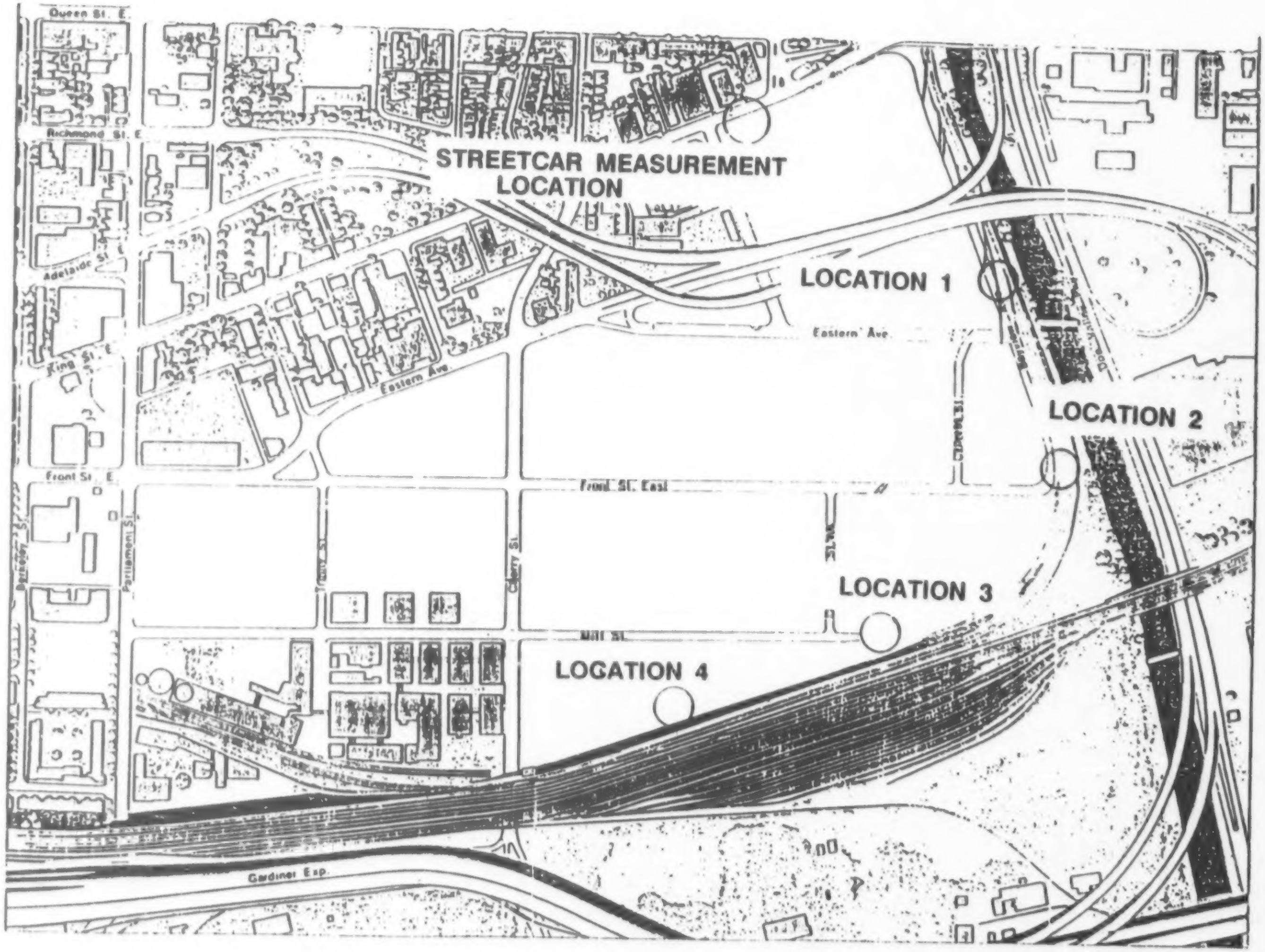
The Lever Brothers Limited manufacturing plant on the east side of the Don Valley Parkway is located approximately 230 m from the southeast corner of Ataratiri. During the site visits, a tonal whine could be heard from the plant during the daytime and night-time period throughout the Ataratiri site. The specific source of noise could not be identified but was typical of mechanical equipment. A sound level of 61 dBA was measured from a location on the eastern boundary of Ataratiri. The company has taken corrective action subsequent to the 1989 noise survey.

Rothsay/Maple Leaf Mills Limited is a rendering facility that is located approximately 300 m south of Ataratiri. During site visits, an exhaust fan was audible on a 24-hour basis. This property was expropriated in 1988 and the plant is scheduled to be closed before any residents move onto the Ataratiri site.

The Toronto Plating Company is located at the northeast corner of Eastern Avenue and Sackville Street. Two window air conditioners are located on the east and south facades of the building. Noise from the air conditioning units was observed to be tonal in nature and may have an impact on future residences proposed for the south side of Eastern Avenue.

Railway lines border Ataratiri on the south and east sides. The trains that use these lines include VIA, GO Transit, freight, switchers and GO ALRT. The Don Sorting Yard are located directly south of Ataratiri. Shunting activity, idling trains, and cabooses were observed in the yards and are potential noise sources. On one occasion during the 1989 noise monitoring program, transfer freight engines and a caboose with a small diesel engine were observed to idle for longer than one hour. Measurements indicate that, without noise control, sound levels from these activities may exceed the criteria at Ataratiri's southern border. Other general sources of noise at the sorting yard include the screeching of wheels and brakes, banging of cars when the trains stop and start, bell and horn noise from the trains, and loud speaker noise.

Preliminary information regarding the future of the Don Sorting Yard suggests that activities in the northern part (the section nearest Ataratiri) will be shifted to the southern


Queen St. E
Richmond St. E
STREETCAR MEASUREMENT LOCATION
Adelaide St. E
King St. E
LOCATION 1
Eastern Ave.
Eastern Ave.
Bayview
Don Valley
LOCATION 2
Front St. E
Front St. East
Berkeley St.
Parliament St.
Trinity St.
Cherry St.
LOCATION 3
Mill St.
LOCATION 4
Gardiner Exp.

3.3

Vibration Measurement Locations

part of the yards. The shift would have a positive result in reducing noise impacting on Ataratiri since it would increase the distance between Ataratiri and the locations of the noise sources.

Shipping activities associated with various industrial activities located on the south side of the Gardiner Expressway such as Canada Malting, Central Soya Mills, and Ontario Cement were also investigated. Noise levels emanating from pumps, engines and compressors on a Lake Ontario Cement ship were measured. These sources, and noise sources in general in this area, are not expected to exceed criteria at Ataratiri due to the large separation distance between this industrial area and the site. Ships' horns were not heard during any of the site visits.

The Toronto Island Airport is located approximately 2.5 to 3 kilometres southwest of Ataratiri. Noise associated with air traffic is described in terms of noise exposure forecast (NEF) contours and NEF contours of less than 30 or 25 are generally interpreted as being acceptable. The NEF 25 contour for the Island Airport does not reach the Toronto mainland. Hence, aircraft noise associated with the airport should not be of concern at Ataratiri.

3.3.5 The 1989 Vibration Monitoring Program

Rail traffic and street car traffic are the two major sources of vibration in Ataratiri at present. As part of the 1989 monitoring program, vibration levels were measured at four locations at various distances from the railway lines that border Ataratiri to the east and south (see Figure 3.3). Vibration levels also were measured along the street car line on King Street East. A principal objective of the monitoring was to determine the shortest distances from the railway tracks at which vibration velocities exceed the guideline of 0.14 mm/s used by CNR. Dwellings proposed for areas in which the vibration velocity level is lower than 0.14 mm/s will not require vibration mitigation measures.

3.3.6 On-site Vibration Levels

The setbacks needed to prevent vibration velocity of more than 0.14 mm/s are estimated to be 25 m for most of the north-south tracks, 17 m where the north-south tracks start to turn to the west, and 30 m for the east-west tracks.

Street car vibrations were measured along King Street East between St. Lawrence Street and River Street. Vibration velocities greater than 0.14 mm/s were measured at distances of 8 m or less from the street car tracks.

High levels of vibration were recorded on Bayview Avenue due to truck traffic. These high levels of vibration are mainly as a result of concrete mix trucks associated with the operations of the McCord concrete plant. This source of vibration will cease by the end of 1991 with the relocation of the McCord operation.

3.4 Anticipated Changes in the 1990s

Many changes are anticipated to occur to the noise and vibration sources in and around Ataratiri over the next few years. All of the on-site, industrial noise sources will cease operations before any residents move onto the site. These sources include the scrap metal yards, Canada Packers, and McCord & Co. Since 1989, operations at Wickett and Craig and Levis Paper Fibres Company have ceased.

Some of the existing off-site noise sources are also expected to change in the near term. The Gooderham & Worts operation may be developed for commercial and residential uses, Rothsay/Maple Leaf Mills Limited is scheduled to be closed, and a portion of the train activity in the Don Sorting Yards will be shifted farther away from Ataratiri.

In addition to changes to the sources, the redevelopment of the Ataratiri site also will influence local noise and vibration levels. For example, grades across the eastern part of Ataratiri may be raised to provide flood protection (see Chapter 6). This could result in elevations being raised as much as 3.5 m near the eastern edge of the site. The higher elevations would lower noise levels originating from the Don Valley Parkway and rail corridor east of the site. Buildings on the site, particularly those around its perimeter, will reduce the influence of off-site sources at mid-site locations (see Section 3.6).

The foot of Cherry Street has been identified as a possible location for a GO Transit station. Such a station would be a potential noise source for Ataratiri. A noise impact assessment would need to be prepared and reviewed by the City of Toronto Department of Public Works and Environment before being approved.

The MOE also has indicated that increasing attention to the control of industrial noise sources will be stressed in the 1990s. The MOE also has indicated that changes to the noise guidelines are under consideration but not yet available. It is expected that noise sources at Ataratiri will need to comply with the new guidelines. The draft guidelines for vibration are not expected to change.

3.5 Predicted Future Noise and Vibration Levels

3.5.1 Prediction Methods

To predict future noise and vibration levels, it first was necessary to predict future characteristics of the two major sources: road and rail traffic. For road traffic, annual average daily traffic (AADT) values were available for the Year 2010 from the Ataratiri investigations described in Chapter 7. In addition to AADT values, other traffic information such as the percentages of vehicles that would be heavy and medium trucks and average velocities were used as inputs for the MOE STAMSON Road Traffic Noise Prediction Model to predict Year 2010 sound levels due to road traffic.

Future predictions of railway noise were based on projected GO train, freight train, and switching movements for the year 2010 (see Chapter 7). Movements along the north-south railway corridor located east of Ataratiri were assumed to be 30% of the total train movements along the east-west corridor. No switcher movements are expected along the north-south railway corridor in the future. Train traffic speeds were assumed to be 50 km/h for freight and switcher trains, and 100 km/h for passenger trains. The east-west rail lines were assumed to be at an elevation 5 m above the existing ground elevation of Ataratiri.

3.5.2 Future Noise Levels

The STAMSON model was used to predict noise levels for the following sources:

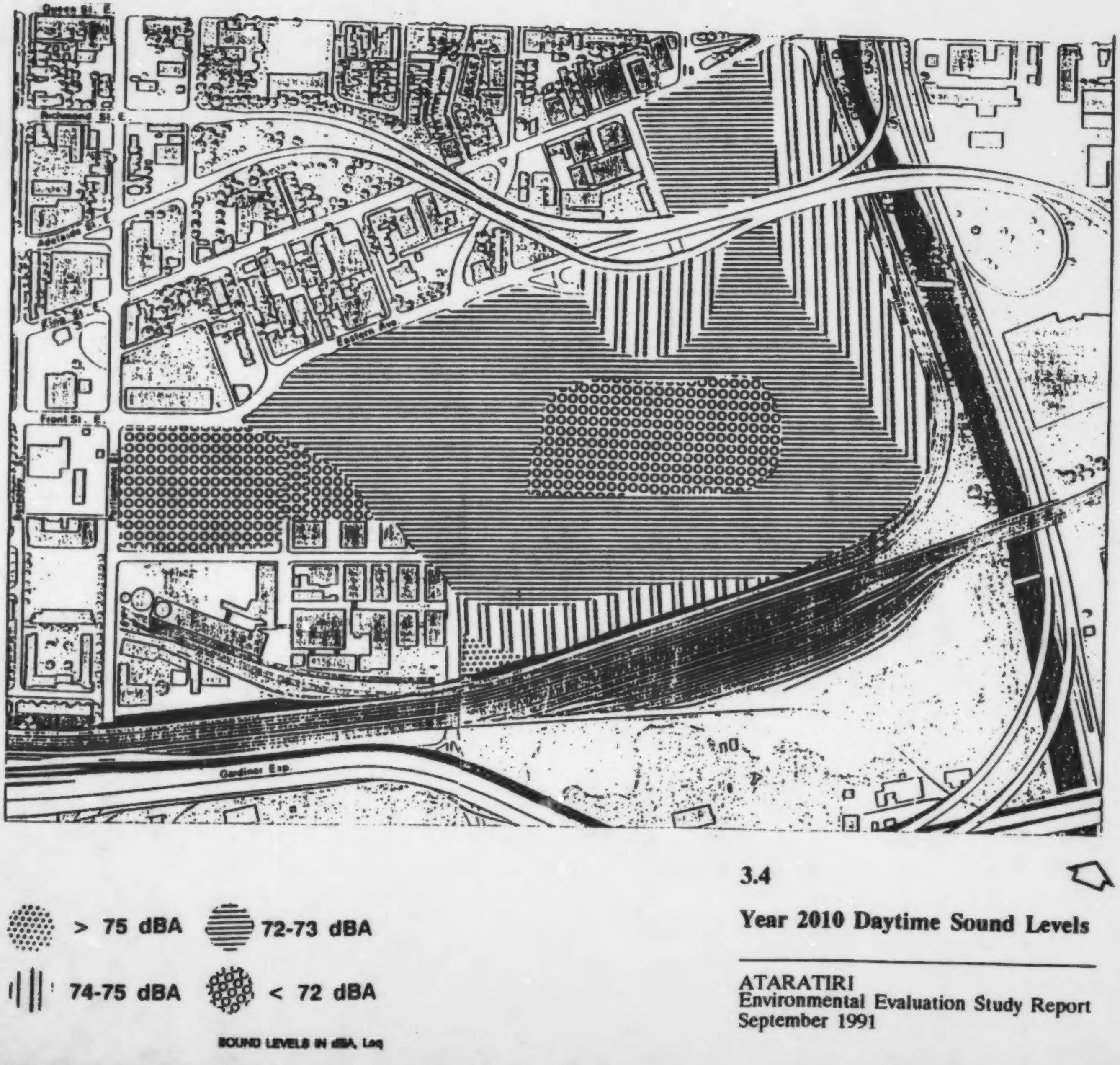
On-site Road Sources
  Bayview Avenue
  Cherry Street
  Eastern Avenue
  Eastern Avenue Diversion
  Front Street East

Off-site Road Sources
  Don Valley Parkway
  Gardiner Expressway
  King Street East
  Parliament Street
  Queen Street East

Off-site Rail Sources
  East-West Rail Corridors
  North-South Rail Corridors

The net impact of all these sources on the noise levels expected in the year 2010 are shown in Figures 3.4 and 3.5. The predicted outdoor sound levels exceed the MOE and CMHC guidelines. Predicted daytime sound level contours indicate that:

- sound levels of 74 to 75 dBA can be expected in areas adjacent to the east-west and north-south railway corridors;
- sound levels of 72 to 73 dBA can be expected along Eastern Avenue west of the Diversion; and
- sound levels of 72 dBA can be expected along Parliament Street and in the interior of Ataratiri.


Queen St. E.
Richmond St. E.
Adelaide St. E.
King St. E.
Front St. E.
Eastern Ave.
Gardiner Exp.
> 75 dBA
72-73 dBA
74-75 dBA
< 72 dBA
SOUND LEVELS IN dBA, Leq

3.4

Year 2010 Daytime Sound Levels

ATARATIRI
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Year 2010 night-time sound levels are shown in Figure 3.5. Reductions of as much as 7 dBA from the daytime sound levels are predicted. Noise levels during the weekend would be about 2 to 3 dBA lower than weekday levels as traffic volumes would not decrease appreciably.

While the predicted results suggest that future noise levels would be similar to, or slightly higher than, those currently experienced at Ataratiri, the STAMSON model assumes that the site is vacant and does not take into account the shielding or noise reductions that on-site buildings will provide. When combined with expected reductions in the numbers of heavy trucks on Ataratiri streets, lower average speeds, and proposed changes to grades across the eastern portion of the site, the overall effect should be future sound levels that are lower than present levels. Nevertheless, it is anticipated that sound levels will exceed MOE guidelines on occasion and that some form of remedial measures will be needed.

3.5.3 Noise-Related Health Considerations

Both the measured noise levels and those predicted for 2010 are below the levels that can cause hearing damage due to long-term exposure. Average noise levels of 80 dBA or lower are generally accepted as posing no risk of hearing damage.

3.5.4 Future Vibration Levels

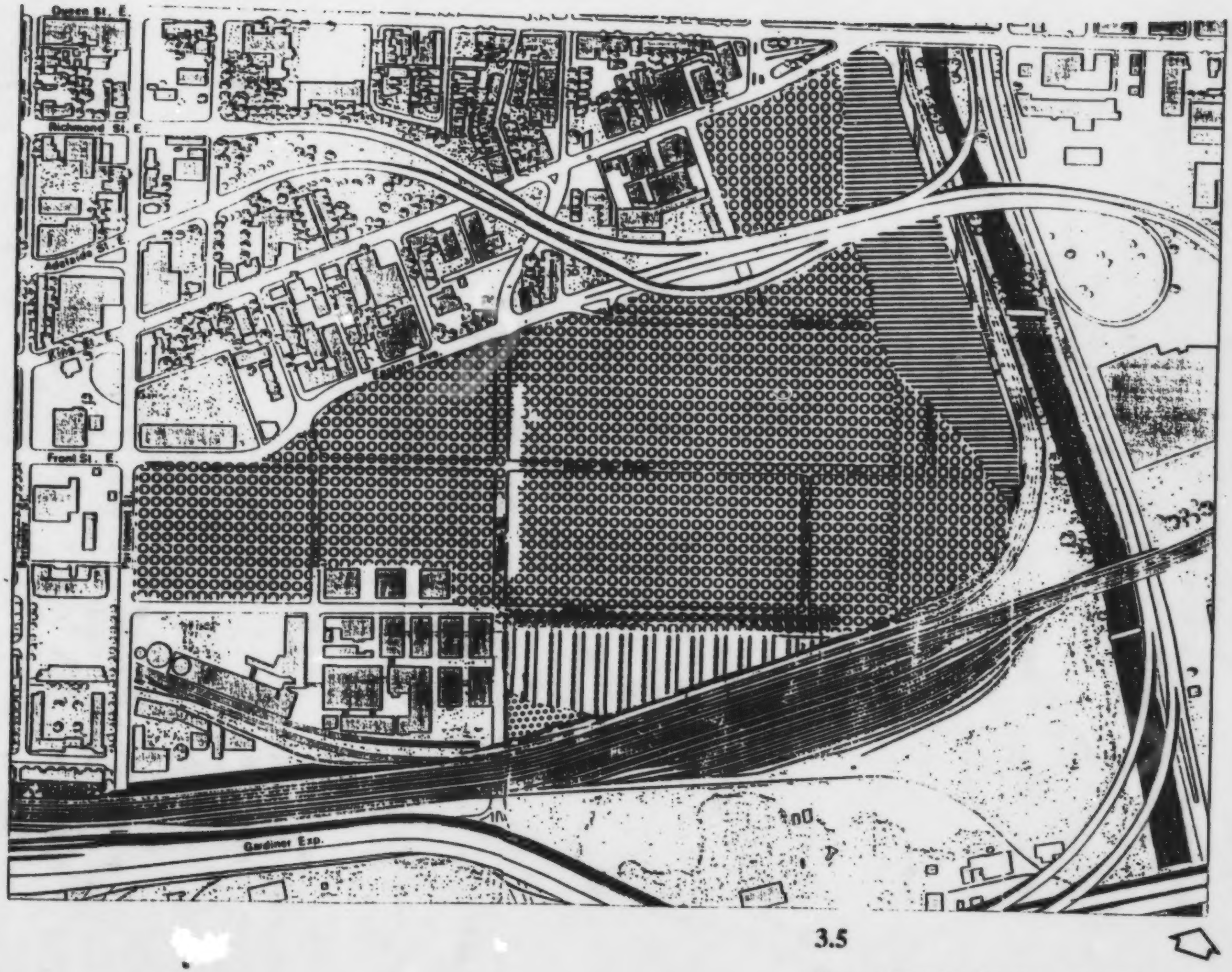
Predictions of vibration levels to the Year 2010 are not required. This is because vibration criteria are based upon the maximum vibration level recorded during a train passby. This is generally caused by the locomotive since it is the most massive piece of rolling stock. These vibration levels are not expected to change unless a significantly more massive engine is used or if the speed limit increases. Neither of these is likely. The railroads strive to lower the vibration levels generated by new pieces of equipment since increases in vibration are damaging to the track and roadbed.

3.6 Remediation Options and Strategies

3.6.1 Site Planning Techniques

Site planning entails using the natural shape of the site, favourable surroundings, and zoning to reduce the noise impact on proposed housing. Examples of site planning techniques include:

- the use of setback distances;
- insertion of noise-insensitive buffer zones;
- orientation of outdoor living areas;


Queen St. E.
Richmond St. E.
Adelaide St. E.
King St. E.
Front St. E.
Eastern Ave.
Gardiner Exp.

● > 75 dBA
▥ 73-74 dBA
▤ 71-72 dBA
○ 68-69 dBA

SOUND LEVELS IN dBA, Leq

3.5

Year 2010 Night-time Sound Levels

ATARATIRI
Environmental Evaluation Study Report

- the use of berms/barriers; and
- the use of structures as barrier blocks.

"Setback" distances require physical separation between the source and the receiver to reduce outdoor sound levels. Large setback distances are usually more practicable in rural areas where land costs are lower. The zones defined by setback distances need not be vacant and can be put to other useful noise-insensitive applications. Typical land uses of the buffer zones are parking, parks and green belts. Commercial or industrial establishments can be used to shield more sensitive land uses from road and rail traffic noise.

In Ataratiri, courtyards of residential buildings will be generally used as private areas for the enjoyment of the outdoors and for passive activities such as relaxation and conversation. Residential buildings bordering major sources of noise can be oriented such that the structure itself can act as a barrier between the noise source and the receiver by shielding the courtyard from noise. The closer together individual buildings are, the greater the shielding with connected buildings representing the ideal case.

Another way of arranging the outdoor living area of the residences is to have it face the source of noise and be protected by the use of a berm or noise barrier wall. The use of berms and walls may be difficult or impractical where noise sources are elevated above existing site elevations. Berms or walls should be constructed so as to block the line of sight between living areas and the noise sources.

Buildings located nearest to the noise sources can serve as noise barriers for the rest of the site. To be effective, these "barrier blocks" should be continuous, be placed as close as possible to the noise source, and be taller than the buildings to be protected. For a site directly exposed to the noise source, ideally the barrier block should abut the noise source. The passageways or gaps between the blocks to provide access should be sufficient to fulfil fire control regulations but be minimized.

Commercial, industrial, and medium density residential buildings can be arranged along the periphery of a residential subdivision to act as a barrier block for the entire site. Reductions in the range of 10 to 17 dBA can be obtained.

Placing taller and continuous structures along the southern border of Ataratiri would be ideal for shielding the entire site from two of the noisiest sources: the east-west rail corridor and the Gardiner Expressway. To provide effective shielding, they must be at least one storey taller than the shielded buildings. To protect outdoor living areas located at ground level, the structures must be one storey taller than the noise sources.

The use of trees to provide shielding from noise sources is not a feasible alternative.

Thirty metres of dense trees is generally required between the source and receiver to provide 5 dBA of attenuation. While this may not be practical for Ataratiri, landscaping areas of Ataratiri would be appropriate for easing the psychological impact of noise.

3.6.2 Architectural Design Features

Architectural design features can be used to meet indoor noise level limits. Terraces of high- and medium-rise apartment buildings and stacked townhouses can be located on the shielded side of the building. This solution can only be applied to one side of a dual-aspect or double-loaded building because of the excessive noise exposure on the other side.

An outdoor living area can be shielded by locating it in the acoustical shadow of a building to reduce levels is an inexpensive measure, easily adopted during the early planning stage. Balconies and terraces should not face major sources of noise like railway tracks or expressways, unless they are too small to be considered outdoor living areas or are glazed solaria.

Indoor noise levels in the noise sensitive areas of the dwelling can be lowered by placing the less sensitive rooms and spaces adjacent to the exposed walls. Areas sensitive to noise include bedrooms, living rooms and dens. By comparison, kitchens and bathrooms are considered to be less sensitive to noise. Closets, storage rooms, hallways, and stairways are not sensitive to noise.

Indoor noise levels also can be lowered by placing most of the windows on walls which are not directly exposed to the noise source. The effectiveness of this measure depends on the orientation of the wall with respect to the noise source. Placing windows on the shielded side of the building can significantly (more than 10 dBA) reduce indoor levels. For walls running perpendicular to the noise sources, the reduction is expected to be slight (less than 3 dBA).

There may be cases where windows must be exposed directly to major noise sources. In such cases, improved glazing will help achieve indoor criteria sound levels. Bedrooms in particular may require upgraded glazing and small window sizes.

Residences along the railway corridors and major roads should have brick or concrete exteriors.

3.6.3 Vibration Control Measures

Preliminary measurements taken adjacent to the railway lines reveal perceptible vibration within 17 to 30 m of the tracks. Proposed dwellings located at distances greater than these "critical" distances will not require vibration control measures. Vibration control for buildings located at less than the critical distance can be achieved by isolating the building foundation. This can be carried out by installing isolators under and beside the foundation. The design of such measures should be based on a detailed analysis of the vibrations to be encountered; however, the plans for Ataratiri do not include locating any buildings within 30 m of a rail corridor.

3.6.4 Preferred Remediation Options

The predicted future noise levels for Ataratiri indicate that measures will be needed to control on-site noise levels. The following measures offer the greatest promise for Ataratiri and should be sufficient to prevent unacceptable levels of noise and vibration throughout the site:

- Parks can be positioned at the borders of the development to increase distance setback to dwellings. The parks may need to be graded so that berms cut the line of sight between activity areas and the noise sources. It is proposed to raise grades in the eastern part of Ataratiri to provide flood protection. The proposal would raise the grade by approximately 3.5 m along the eastern edge of the development. This grade would be higher than the rail corridor to the east of the site. (For further discussion see Chapter 6).

- Buildings along the perimeter of the site should be reserved for industrial or commercial uses wherever possible. These will provide shielding for internal residences. The most critical areas are adjacent to the Eastern Avenue diversion and the southern portion of Cherry Street due to excessive noise levels and the raised elevation of the sources. The next most critical is the remainder of the triangle bounded by Cherry Street, Mill Street, and the Don Sorting Yard.

- Sensitive land uses such as residences, schools, daycare facilities, etc. should not be located adjacent to the Eastern Avenue Diversion or near the southernmost portion of Cherry Street due to excessive noise levels in the area.

- Outdoor living areas should not be positioned immediately adjacent to the south border of the site. Excessively high noise barriers would be required due to the raised elevation of the Gardiner Expressway and Don Sorting Yard.

- Residential buildings along Parliament, Front, Cherry, and Eastern should front these streets thereby acting as a shield for outdoor living areas or common courtyards. If dwellings back onto these streets, outdoor living areas and common courtyards will need to be protected through the use of acoustical barriers.

- All dwellings along the perimeter of the site will need to be centrally air conditioned with any outdoor condensing units placed in a location away from the outdoor living areas. Dwellings in the interior of the site may require central air conditioning systems depending on shielding provided by surrounding dwellings. As a minimum, these dwellings will require an alternate means of ventilation so that windows can be closed against the noise.

- Unprotected balconies and terraces along the perimeter of the site should face toward the interior of the site away from major road and rail noise sources. Glazed solaria may be a viable alternative for facades facing the perimeter.

- Dwellings along the perimeter of the site must be designed so that the building facade components (windows, walls, exterior doors, etc.) supply adequate acoustic insulation.

- Buildings on the perimeter of the site along the railway corridors should have brick or concrete exteriors to maximize acoustic insulation against rail traffic noise. sources.

- Proposed dwellings adjacent to the east-west rail corridor should be constructed not less than 30 m from the tracks to avoid the need for vibration mitigation measures. Similarly, for proposed dwellings adjacent to the north-south rail corridor, the minimum distance is 25 m. Close to the area where the north-south tracks start to turn to the west, dwellings should not be constructed less than 17 m. If these setbacks are not possible, further measurements and detailed isolation design will be required.

- Since the redevelopment of Ataratiri is planned to occur in phases, some of the on-site noise sources may still be present and impact early phases of the development. Leases held by the City of Toronto for on-site industries should only be renewed if the industry can show that MOE noise guidelines will not be exceeded at Ataratiri. Application for Certificates of Approval should be made to the MOE for the installation of noise control equipment.

3.7 Recommended Further Studies

The protective measures eventually used at Ataratiri for noise and vibration will only become better defined as details of specific buildings become known. In addition, changes are being considered at neighbouring sites that could influence the types and extent of protective measures used at Ataratiri. As a result, several types of further studies will be needed:

- Noise impact assessments should be performed during the planning stage of each sub-area of Ataratiri for review by the MOE. In addition to considering the impact of on- and off-site road and rail traffic, these assessments should consider the impact of any existing or planned stationary sources of sound. For example, the effectiveness of recently installed noise control measures at Lever Brothers Limited should be assessed.

- Class 3 noise impact assessments should be prepared for each individual building in the development for a review by the City of Toronto Department of Public Works and the Environment.

- As is currently required by the City of Toronto, acoustical engineers should review and certify the design drawings for conformance with the recommendations. In addition, they should perform inspections as required to certify that the buildings have been constructed in accordance with the recommendations and all applicable acoustical standards.

- The redevelopment of the Gooderham & Worts site should include a noise impact study to assess its potential impact on Ataratiri and determine if control measures must be included in the redevelopment to protect Ataratiri.

- The future activities in the Don Sorting Yard should be studied to ensure that noise levels impacting Ataratiri are lowered as much as possible. This study would involve determining the locations and number of shunting operations which will occur, typical noise levels generated by each operation and an assessment of the total noise levels produced.

- The potential noise and vibration impacts of the proposed GO Transit station adjacent to Ataratiri should be assessed. Any necessary control measures should be incorporated into its design.

- If residential dwellings are proposed to be constructed closer than 30 m from the rail tracks, additional vibration studies should be undertaken to allow the design of the required isolation.

4.0 SOIL QUALITY

4.1 Overview

Much of the Ataratiri site has been used for industrial purposes during the past 100 years. These activities, as well as the quality of the materials used as fill in sections of the site have resulted in extensive contamination of site soil. Before the redevelopment of Ataratiri can proceed, a plan must be formulated to manage contaminated soils.

Several of the conditions of the Ataratiri Exemption Order concern soil quality. For example, Condition 2 requires that the EES report contain an overview of key soil quality concerns and propose a soil management plan for the site. Condition 3 requires that soil and groundwater management programs be developed for each area of the site that examine if, how, and where contaminated soil should be removed.

Shortly after the Exemption Order was granted, investigations were initiated to determine the extent of soil and building contamination and to identify potential environmental concerns. Three firms were retained in 1988 to carry out these preliminary studies:

- MacLarentech Inc. investigated the portions of the site that are south of Eastern Avenue and east of Cherry Street (MacLarentech, 1989);

- The Proctor & Redfern Group investigated the portions of the site that are north of Eastern Avenue or west of Cherry Street (Proctor & Redfern, 1989); and

- M.M. Dillon Limited investigated the land at 554 Lakeshore Boulevard East south of Ataratiri (M.M. Dillon, 1988).

The results of those investigations indicate that soils at the site contain various substances at concentrations above provincial and/or federal guidelines for residential or commercial/industrial land uses.

In 1989, the City retained Trow, Dames & Moore (TDM) to undertake several additional tasks related to soil quality at Ataratiri:

- consolidate and review the findings of the previous three investigations;
- design and implement studies that describe more accurately the nature and extent of soil contamination; and
- provide a basis for developing comprehensive remedial action strategies.

This chapter summarizes the findings reported by TDM (1991a). It includes a review of

Table 4.1

FEDERAL SOIL QUALITY GUIDELINES

Polycyclic Aromatic Hydrocarbons (PAHs) at Abandoned Coal Tar Sites

Compound	A Value	B Value	C Value
benzo[a]anthracene	0.1	1	10
benzo[a]pyrene	0.1	1	10
benzo[b]fluoranthene	0.1	1	10
benzo[k]fluoranthene	0.1	1	10
dibenzo[a,h]anthracene	0.1	1	10
indeno[1,2,3-c,d]pyrene	0.1	1	10
naphthalene	0.1	5	50
phenanthrene	0.1	5	50
pyrene	0.1	10	100

Notes:

All concentrations in μg/g dry weight.

less than A - below routinely achievable detection limit
A to B - slightly contaminated, soil clean-up usually not necessary
B to C - contaminated; clean-up may be needed but land use restrictions may suffice
greater than C - contaminated; clean-up likely or restrictions on all types of land uses

Reference: CCREM, 1988

Polychlorinated Biphenyls (PCBs)

0.5 μg/g for agricultural land
5 μg/g for residential and park land
50 μg/g for commercial and industrial land

Reference: CCREM, 1987

relevant criteria and guidelines, a history of land uses and activities at Ataratiri, a brief description of physical site characteristics, a summary of the soil quality investigations that have been undertaken, an outline of the health issues related to soil quality, a review of potential remediation options, a description of the overall soil management plan, and recommendations for further studies.

4.2 Relevant Criteria and Guidelines

4.2.1 Federal

Several initiatives have been undertaken by federal agencies over the past few years to develop soil quality guidelines. To date, these efforts have focused on a few contaminants and/or situations that pose relatively high levels of concern. Specifically, recommendations have been made concerning polycyclic aromatic hydrocarbons or PAHs at abandoned coal tar sites (CCREM, 1988) and polychlorinated biphenyls or PCBs (CCREM, 1987). Table 4.1 summarizes these values.

The values for PCBs (with one exception) have been adopted as "interim guidelines" by the MOE (see Section 4.2.2). The PAH values have not been given similar stature by the MOE but have been used at some sites in Ontario where coal tar contamination has been found.

4.2.2 Provincial

Table 4.2 presents the clean-up guidelines recommended by the MOE (1989b) for 22 parameters (mostly metals and a few general indicators of soil quality such as pH and conductivity). These guidelines cover two categories of land use (agricultural/ residential/parkland and commercial/industrial). The guidelines are based on several considerations, including potential adverse effects on human health, potential adverse effects on plants, and potential adverse effects on grazing animals. The guidelines for four of the parameters (antimony, barium, beryllium, and vanadium) are designated as "provisional".

The MOE ha also established "interim" guidelines for PCBs and dioxins and furans (PCDDs and PCDFs) but province-wide guidelines have not been established for most organic compounds, including many of the compounds that have been measured at Ataratiri. Where province-wide guidelines have not been established, the MOE suggests that guidelines from other jurisdictions may be appropriate. Alternatively, site-specific guidelines can be proposed.

In 1988, the Inter-Ministry Committee on Clean-up Criteria (ICCC) established values for

Table 4.2

MOE SOIL CLEAN-UP GUIDELINES[1]

	Agricultural/Residential/Parkland Type of Soil[2]		Commercial/Industrial Type of Soil	
Parameter	Medium & Fine	Coarse	Medium & Fine	Coarse
Guidelines:				
pH	6 to 8	6 to 8	6 to 8	6 to 8
EC (mS/cm)	2	2	4	4
SAR	5	5	12	12
nitrogen (%)[3]	0.5	0.5	0.6	0.6
oil & grease (%)[4]	1	1	1	1
arsenic	25	20	50	40
cadmium	4	3	8	6
chromium (VI)	10	8	10	8
chromium (total)	1000	750	1000	750
cobalt	50	40	100	80
copper	200	150	300	225
lead	500	375	1000	750
mercury	1	0.8	2	1.5
molybdenum	5	5	40	40
nickel	200	150	200	150
selenium	2	2	10	10
silver	25	20	50	40
zinc	800	600	800	600
Provisional Guidelines:				
antimony	25	20	50	40
barium	1000	750	2000	1500
beryllium	5	4	10	8
vanadium	250	200	250	200

Notes

All values in µg/g unless indicated.

1 For comparison with these guidelines, analyses for metal and metalloids must be conducted using an approved strong, mixed-acid digestion procedure.

2 Defined as greater than 70% sand and less than 17% organic matter.

3 If nitrogen levels exceed the guidelines, the mineralization of the soils should be evaluated. Additions of nitrogen-based fertilizer may be counterproductive.

4 Guideline is for fresh oil; for weathered oil (minimum of 2 years exposed on-site), the guideline is 2%.

more than 40 organic compounds (ICCC, 1988). These values, often referred to as the "Shell/Texaco" guidelines, were developed to assess conditions at two former petroleum refineries located west of Toronto. At the recommendation of the MOE, these guidelines have been used to assess soil quality at Ataratiri. Due to some of the assumptions made about the ways that the refinery sites would be used once they have been redeveloped (such as suburban houses having backyard gardens that contain remediated soil), the Shell/Texaco guidelines are likely more protective of human health than they need to be for Ataratiri where there will be no residential exposure to remediated soils (CanTox, 1991a).

The Shell/Texaco guidelines are for residential land use only. The ICCC recommended that the guidelines for residential land use be multiplied by a factor of two for commercial or industrial land use. (For example, if the residential guideline for a compound is 1.2 μg/g, the commercial/industrial guideline would be 2.4 μg/g.)

Another aspect of the Shell/Texaco guidelines that influences how they are used, is that the guidelines actually consist of "clean-up levels" and "trigger levels". As defined by the ICCC, soils that do not comply with the clean-up levels require remedial action. When soils do not comply with trigger levels, the situation requires further examination to determine if remedial action is necessary.

The Shell/Texaco guidelines address all but six of the PAHs analyzed in Ataratiri soils. For those six compounds, it will be necessary to develop guidelines specifically for Ataratiri. Based on the results of the same exposure pathways model used in the process of establishing the Shell/Texaco guidelines and the results of a "background" soil sampling program in the City of Toronto (SENES, 1991), guidelines for the six PAHs have been suggested and submitted to the MOE for comment (CanTox, 1991b).

Table 4.3 summarizes the guidelines for organic compounds that have been used to evaluate soil quality at Ataratiri. Collectively, these guidelines provide the means for determining where and when soil quality is suitable for various land uses. They can also be used to estimate the volumes of soil that will need to be remediated, removed, or otherwise managed.

In addition to the guidelines and criteria noted above, the MOE has also issued regulations that define when contaminated soil is considered to be a waste and subject to special management options. Ontario Regulation 11/82 defines soils containing greater than 50 ppm of PCBs as "PCB waste". Such material must be stored in an approved manner until disposal methods have been established (MOE, 1982). Regulation 309 under the Environmental Protection Act describes the test procedure used to determine if a soil is a "registerable waste" or a "hazardous waste" (MOE, 1989c). Registerable waste can only be disposed at municipal landfills that agree to accept the material. Hazardous waste must

Table 4.3

SOIL GUIDELINES FOR ORGANIC COMPOUNDS

Compound	Value[1]	Type of Guideline	Reference
benzene	1.6	clean-up level	ICCC, 1988[2]
ethylbenzene	1.6	trigger level	ICCC, 1988
toluene	1.6	trigger level	ICCC, 1988
xylene	10	clean-up level	ICCC, 1988
anthracene	6	trigger level	ICCC, 1988
benzo[a]anthracene	7.9	clean-up level	ICCC, 1988
benzo[a]pyrene	1.2	clean-up level	ICCC, 1988
benzo[b]fluoranthene	1.2	trigger level	ICCC, 1988
benzo[k]fluoranthene	6.6	clean-up level	ICCC, 1988
chrysene	14	trigger level	ICCC, 1988
dibenzo[a,h]anthracene	0.9	clean-up level	ICCC, 1988
fluoranthene	15	trigger level	ICCC, 1988
naphthalene	4	trigger level	ICCC, 1988
phenanthrene	14	trigger level	ICCC, 1988
pyrene	24	trigger level	ICCC, 1988
polychlorinated biphenyls	5[3]	interim guideline	MOE, 1988
dioxins + furans	0.001[4]	interim guideline	MOE, 1990

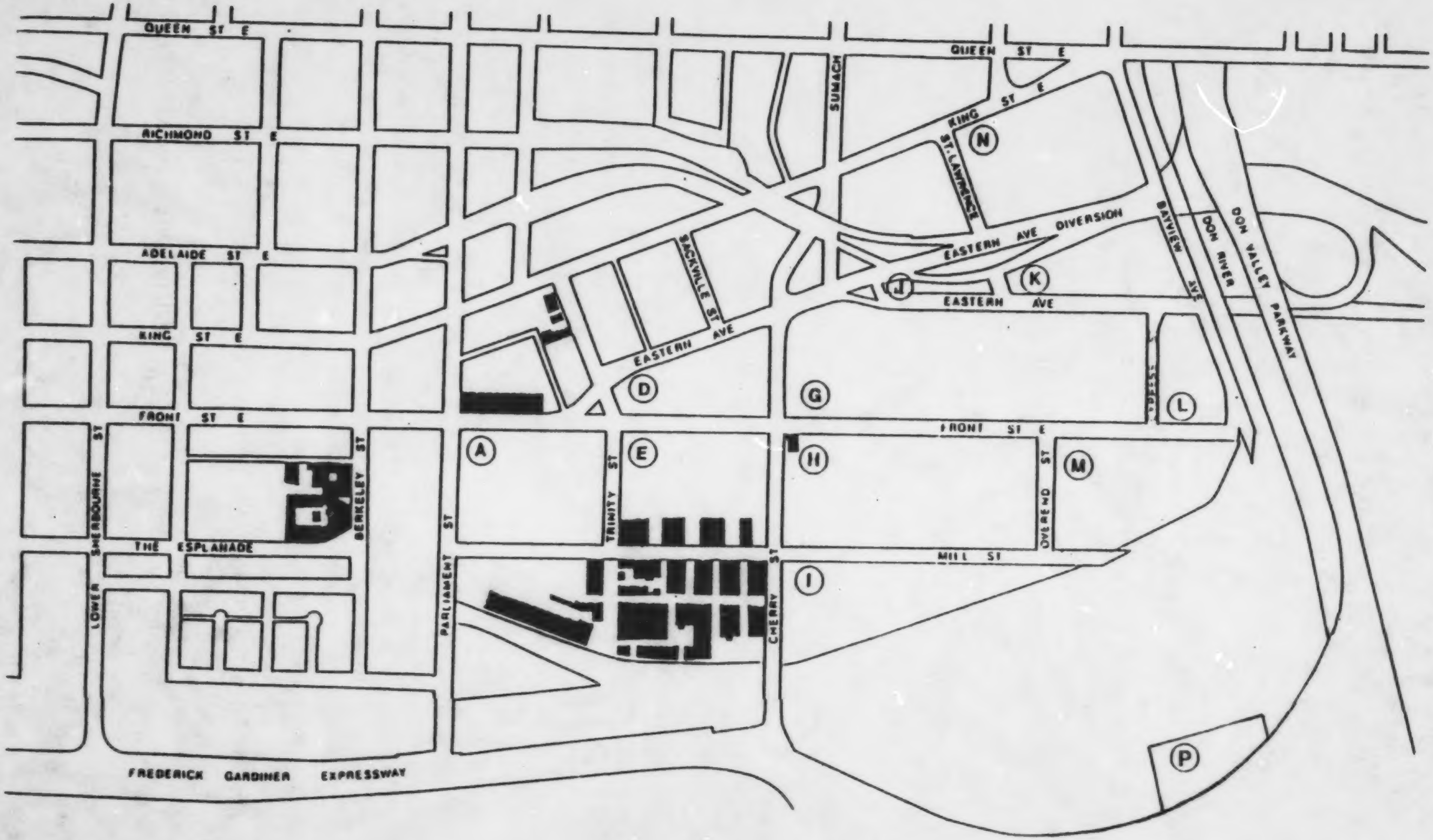
Notes

1 All values are expressed in $\mu g/g$ dry weight basis. All apply to soils in residential or parkland settings.

2 ICCC, 1988 also establishes clean-up levels and trigger levels for several compounds not included in Ataratiri soil sampling programs.

3 The MOE often uses a factor of two to estimate commercial/industrial guidelines from residential guidelines. One exception is the commercial/industrial guideline of 25 $\mu g/g$ for PCBs. Some of the inorganic parameters included in Table 2 are other exceptions.

4 The guideline for dioxins plus furans is expressed as toxic equivalents of 2,3,7,8-TCDD.


QUEEN ST E
RICHMOND ST E
ADELAIDE ST E
KING ST E
FRONT ST E
THE ESPLANADE
LOWER SHERBOURNE ST
BERKELEY ST
PARLIAMENT ST
TRINITY ST
CHERRY ST
SUMACH
SACKVILLE ST
EASTERN AVE
KING ST E
ST. LAWRENCE
EASTERN AVE DIVERSION
BAYVIEW AVE
DON RIVER
DON VALLEY PARKWAY
FRONT ST E
MILL ST
OVEREND ST
FREDERICK GARDINER EXPRESSWAY
A
D
E
G
H
I
J
K
L
M
N
P

4.1

Block Locations

be taken to a hazardous waste treatment or disposal facility. (Currently only one hazardous waste management facility exists in Ontario.)

4.3 Land Use History

4.3.1 Block-by-Block Historical Review

Each of the four investigations of sub-surface conditions undertaken at Ataratiri between 1988 and 1990 included the preparation of land use histories for part or all of the site and adjacent lands. Such historical reviews can identify potential sources of contamination and suggest the types of contaminants to be investigated.

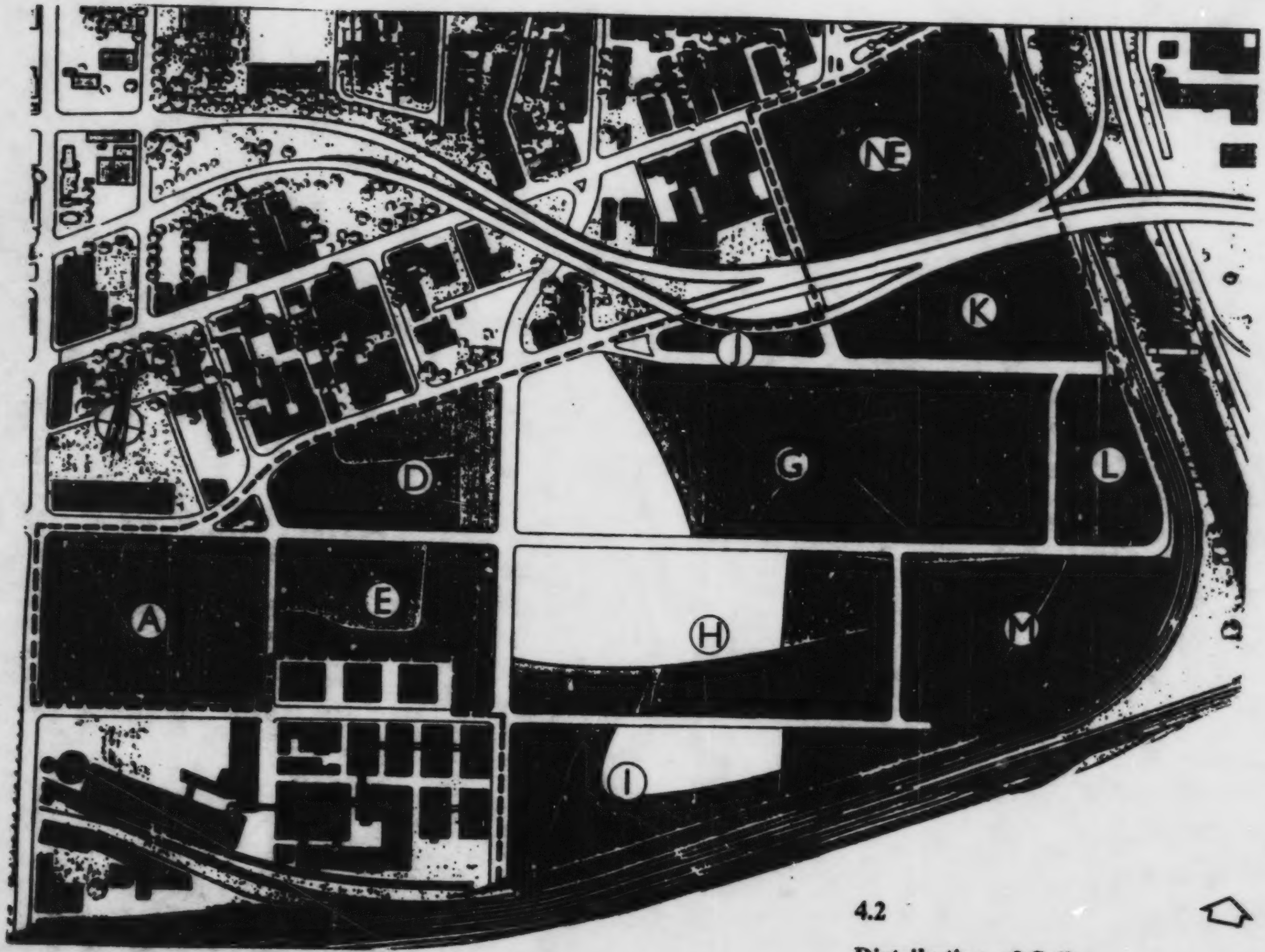
Sources of historical information that were consulted during these historical reviews included City Directories, Goad's Atlas maps, fire insurance maps from the City of Toronto Archives, and aerial photographs from the University of Toronto Library. In addition, discussions were held with staff of regulatory agencies (Environment Canada, MOE, Ministry of Consumer and Commercial Relations, Fire Marshall's Office) and several utilities.

These efforts made it possible for land use histories to be compiled back to the mid 1850s. The following summaries are presented on a block-by-block basis. Figure 4.1 illustrates the block locations.

Block A was dominated by a coal gasification plant between the late 1840s and the early 1960s. The eastern portion of the block was used for storage and distribution of the gas while the western portion was used for generating and processing the gas. The property west of Block A was used for storing and crushing coal and coke. Coal tar produced at the plant was stored in several tanks in the southwest corner of Block A.

Small portions of Block A were used for other industrial activities while the coal gasification plant was present. Those of note from the perspective of potential soil contamination included an ammonia company, a roofing company, a battery company, a barrel and bottle company, and a chemical/oil company. The coal gasification plant was demolished in 1960 and that part of the block remained vacant until the 1970s. Recent uses included a parking lot, a garage, library offices, a car dealership, a paper recycling warehouse, a food distributor, and a natural gas feeder station.

Block D was largely residential until the 1920s when the houses were replaced by a plant that manufactured metal products. These included several foundries, a metal spring company, a steel distribution warehouse, and a structural steel company. By the late 1970s, an auto supply company, a truck and trailer company, a health club, and a carpet store


NE
K
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I
▨ areas that generally exceed industrial/commercial clean-up guidelines
▤ areas that generally exceed residential clean-up guidelines
☐ areas that generally meet residential clean-up guidelines

4.2

Distribution of Soil Contamination

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were present. A service station has occupied a small parcel at the intersection of Front Street East, Trinity Street, and Eastern Avenue since the early 1960s.

Block E was largely residential until the turn of the century when it was converted to commercial and industrial purposes. Since that time, land uses have included an iron and steel company, gas stations at the intersection of Front and Trinity Streets and the intersection of Front and Cherry Streets, a battery company, a coal and coke company, and two scrap yards (both of which are still operating: one at the corner of Cherry and Mill Streets and the other at the corner of Front and Cherry Streets).

Block G was converted from residential use to commercial and industrial uses shortly after the turn of the century. Since the late 1920s, the southern half of the block has been occupied by railway sidings and associated sheds, warehouses, and cartage companies. Other land uses of note have included a metal foundry, a metal pipe manufacturing company, an automotive service shop, and a charcoal company.

Since the late 1900s, much of **Block H** has been used for railway sidings and associated buildings. Commercial or industrial activities of note include several coal/fuel companies, a paving company, a chemical storage company, a scrap yard, an auto wrecker, and a machine shop. Current land use is dominated by the rail tracks and offices, a freight terminal, and a cartage company.

Most of **Block I** has been used for railway sidings and associated coal yards, offices, and workshops since the mid 1850s. The land along Cherry and Mill Streets was largely undeveloped until the mid 1930s. Since that time, activities have included a rubber salvage company, several fuel companies and scrap metal yards, and a roofing company. In the 1950s and 1960s, those uses were replaced by various freight sheds and warehouses.

Block J was residential from the 1850s to the early 1930s. At that time, a gradual transition occurred to industrial uses. Several scrap metal yards, a machine shop, and automotive repair shops were present. In the early 1960s, many of the structures in the block were removed to construct the Eastern Avenue Diversion.

Block K was largely unused prior to 1900, although an oil company and varnish manufacturer were located in the middle of the block. Until the 1880s, the Don River occupied the eastern portion of the block. The river was relocated eastward to its current location. Since 1900, industrial activities of note have included a paving company, a coal company, three scrap metal yards, a tannery, a tallow refinery, a soap and oil company, and a waste paper salvage facility.

Block L is dominated by a leather tannery which has been in operation since the early 1880s. Like Block K, the Don River occupied the eastern half of this block until it was relocated eastward in the late 1880s.

Block M has been occupied largely by food packaging operations since the 1860s. Other types of land uses have included a soap manufacturer, resin storage company, a chemical dye company, and an oil company.

Block NE was largely undeveloped until the Don River was relocated in the late 1880s. Since that time, commercial and industrial activities of note include railway yards, a machine shop, several automotive dealers and repair shops, a textile and furniture manufacturing complex, a coal yard, a scrap yard, a varnish and paint manufacturing plant, a tannery, and an oil company. Since the 1920s, a construction materials company (McCord & Co.) has occupied most of the block.

Block P is located a short distance south of Ataratiri. The block was reclaimed from Lake Ontario around 1920. Since that time, it has been occupied by a rendering plant for animal parts.

4.3.2 Potential Sources and Types of Contaminants

Many of the types of land uses and activities described in Section 4.3.1 are potential sources of soil contaminants. The types of contaminants commonly associated with various activities that have occurred at Ataratiri include:

- coal gasification plants (and specifically leaks from storage tanks and associated piping) which are frequently sources of soil and groundwater contamination involving PAHs;

- metal foundries and scrap yards which are sources of metals and various organic compounds including PAHs, PCBs, and dioxins/furans; and

- service stations and garages are sources of organic compounds (particularly the volatile compounds associated with fuels) and metals.

Other types of activities that have occurred at Ataratiri which often lead to soil contamination include many types of chemical production or distribution facilities, storage facilities (particularly for materials such as coal, coke or oil), and rail yards. The contaminants present in such areas reflect the products or materials that have been used or handled.

Leaking underground storage tanks are a frequent cause of soil contamination. Preliminary investigations have identified underground storage tanks at numerous locations across Ataratiri and it is anticipated that more will be found as specific sites are decommissioned.

4.3.3 Off-Site Land Uses of Potential Concern to Soil Quality

Historical land use surrounding Ataratiri followed the same general trends observed at Ataratiri with early residential neighbourhoods giving way to mixed industrial and commercial use. Of particular interest was the coal gasification operations adjacent to Block A. Water gas purifiers occupied the property directly north of Block A, across Front Street East, and were connected via underground piping to the process equipment and to the gas storage facilities on Block A. The property west of Block A was used for crushing and storage of raw coal and coke. These operations may have contributed to soil contamination in Block A. Although they are not located on the Ataratiri site, their presence will need to be taken into account when remediating Block A.

Current land uses surrounding Ataratiri include residential to the north, industrial to the south and east, and residential/commercial to the west. Railway corridors flank the southern and eastern portions of the site. There is no evidence that current off-site land uses are of potential concern to soil quality at Ataratiri; however, it is possible that elevated roadways and other air emission sources upwind of Ataratiri may have contributed to soil contamination on-site.

4.4 Physical Characteristics

4.4.1 Overburden

The overburden at Ataratiri is generally 8 to 10 m thick across the site except along the eastern boundary near the Don River where it reaches up to 30 m deep. The overburden can be separated into two distinct layers: fill and native soils.

The fill is a layer of heterogeneous granular material (predominantly sand and silts), that was used to raise the level of the site. Across much of Ataratiri, the fill also contains bricks, wood, cinders, and other debris. The fill layer is approximately 1 to 3 m thick over most of the site. Pockets of deeper fill (4 to 5 m) are found at locations once occupied by buildings but since demolished and infilled. Along the eastern edge of the site, where the former channel of the Don River was located, there are approximately 2 to 5 m of fill material.

Underlying the fill are several types of native soils. These include brown silts and sands (typically 0.7 to 2.0 m thick) over grey silt and clay till. The silts and sands were observed in roughly half of the boreholes drilled on-site. The till overlies the bedrock except along the southern edge of the site where a layer of coarse sand and gravel is present immediately above the bedrock. In the vicinity of the former channel of the Don River, the native soils include a thick unit of fluvial sands and silts with peat layers overlying the till.

In the western portion of the site, the depth of native soils ranges from 5 to 8 m. In the central and eastern portions, there are approximately 7 to 8 m of native soils. This rapidly increases along the eastern boundary to approximately 30 m near the former channel of the Don River.

4.4.2 Bedrock

Bedrock in the area consists of grey shales, siltstones, mudstones, and limestones of the Georgian Bay Formation. The bedrock surface slopes gently towards the southeast except for a relatively steep drop to the east along the former channel of the Don River.

4.5 Soil Quality Investigations

4.5.1 Monitoring Programs

As noted in Section 4.1, several investigations of soils have been undertaken at Ataratiri since the development was announced. The first investigations each addressed portions of the site, while the most recent investigation was undertaken to fill information gaps identified in the first three.

All of the investigations involved collecting soil samples from various depths which were analyzed for various physical and chemical properties. After each sample was collected, the sampling tools were thoroughly cleaned to prevent cross-contamination.

Surface samples were collected from areas not covered with pavement. Typically, three subsurface samples were taken from each borehole location consisting of one shallow sample (0.3 to 0.7 m) and two samples from greater depths. The selection of samples for analysis was based on features such as colour, texture, and odour. In some cases, a soil gas detector was also used to identify samples likely to be contaminated. Selecting samples on such a basis has a tendency to bias analytical programs toward overestimating the extent of contamination, but, is preferable to underestimating the extent of contamination.

In total, soil samples were collected from more than 250 locations. These efforts resulted in approximately 700 samples being sent to laboratories for analysis. Most of the samples were analyzed for metals (such as copper, lead, nickel, zinc) and major ions (such as calcium, sodium, magnesium, chloride). Generally, fewer samples were analyzed for organic compounds. Tables 4.4 and 4.5 summarize the number of samples analyzed for each parameter as well as the average, minimum, and maximum concentrations measured.

Table 4.4

SUMMARY OF SOIL SAMPLING RESULTS - METALS

Parameters	Sample Size	Average (μg/g)	Minimum (μg/g)	Maximum (μg/g)	No. > Residential Guidelines	No. > Industrial Guidelines
antimony	724	6	nd	400	33	19
arsenic	747	13	nd	312	116	38
barium	754	520	15	2420	107	107
beryllium	753	3	nd	10	34	4
cadmium	747	3	nd	60	114	58
chromium (VI)	713	0.14	0.024	5	7	7
chromium-total	767	60	1.19	1420	8	1
cobalt	754	14	nd	120	77	56
copper	767	151	2	29800	93	59
lead	767	230	nd	14000	125	92
mercury	750	0.22	trace	17.4	218	71
molybdenum	767	5	1	74	476	5
nickel	767	59	nd	10000	26	11
selenium	754	0.6	0.08	6.8	9	0
silver	768	2.7	nd	31	1	0
vanadium	770	79	nd	9200	12	11
zinc	767	349	14	18900	79	61
pH (units)	574	8.06	3.92	11.96	262	262
EC (mS/cm)	574	0.619	nd	>6.0	30	7
SAR	689	5.312	0.01	29.4	272	94
Oil + Grease (%)	628	0.596	nd	18.4	75	75
Total Nitrogen (%)	598	0.092	nd	1.64	7	5

Notes:

nd - not detected

Table 4.5

SUMMARY OF SOIL SAMPLING RESULTS - ORGANICS

Parameters	Sample Size	Average (μg/g)	Minimum (μg/g)	Maximum (μg/g)	No. > Residential Guidelines	No. > Industrial Guidelines
VOCs						
benzene	38	0.1	nd	0.8	0	0
toluene	38	0.164	nd	0.9	(0)	0
ethylbenzene	38	0.105	nd	0.367	(0)	0
xylene	38	0.257	nd	1.3	0	0
PAHs						
acenaphthene	33	2.42	nd	21.5	-	-
acenaphthylene	33	4.38	nd	60.7	-	-
anthracene	33	3.09	nd	38	(4)	-
benzo[a]anthracene	576	3.82	nd	194	52	41
benzo[b]fluoranthene	577	4.2	nd	162	(176)	44
benzo[k]fluoranthene	272	2.6	nd	51.69	26	18
benzo[g,h,i]perylene	33	3.93	nd	44.4	-	-
benzo[a]pyrene	578	4.08	nd	229	168	41
chrysene	33	4.37	nd	38.2	(2)	-
dibenzo[a,h]anthracene	580	1.16	nd	151	69	9
fluoranthene	33	10.23	nd	108	(4)	-
fluorene	8	5.03	nd	36	-	-
indeno[1,2,3-cd]pyrene	579	2.28	nd	131.91	(127)	30
naphthalen	581	23.91	nd	7966.7	(41)	22
perylene	8	0.57	nd	1.33	-	-
phenanthrene	581	13.25	nd	1342	(53)	32
pyrene	581	9.87	nd	648.1	(39)	11
PCBs	574	8.19	nd	2252	14	7
Dioxins and Furans						
Total PCDDs & PCDFs	13	0.906	nd	4.22	3	3

Notes:

* expressed as ppb TEQ as 2,3,7,8-TCDD

() - the number of samples exceeding trigger levels

nd - not detected

Table 4.6

CONTAMINANTS OF CONCERN IN SOIL

Metals

- antimony
- arsenic
- barium
- cadmium
- cobalt
- copper
- lead
- mercury
- molybdenum
- nickel
- vanadium
- zinc

Polycyclic Aromatic Hydrocarbons (PAHs)

- anthracene
- benzo[a]anthracene
- benzo[a]pyrene
- benzo[b]fluoranthene
- benzo[k]fluoranthene
- chrysene
- dibenzo[a,h]anthracene
- indeno[1,2,3-c,d]pyrene
- naphthalene
- phenanthrene
- pyrene

Polychlorinated Biphenyls (PCBs)

Indicator Parameters

- pH
- sodium adsorption ratio (SAR)
- total oil and grease

4.5.2 Contaminants of Concern

Comparing the analytical results from the soil samples collected across Ataratiri with the various guidelines described in Section 4.2 indicates that some guidelines are frequently exceeded in portions of the site. The chemicals that frequently exceed the guidelines (i.e. greater than 5% of the samples tested) are considered to be contaminants of concern and will need to be treated, removed, or otherwise managed at Ataratiri. Table 4.6 lists these contaminants.

Several other contaminants were included in analytical programs that either were not detected or were measured at very low concentrations and/or in relatively few samples. These contaminants are not considered to be of widespread concern at Ataratiri. As specific areas of Ataratiri are being cleared or redeveloped, the list of contaminants of concern may need to be expanded as new information becomes available. For example, if a leaking fuel storage tank is found, the local contaminants of concern could include various volatile organic compounds typically associated with fuels.

4.5.3 Areas of Concern

Much of the fill material found at or just below the surface of Ataratiri does not comply with one or more of the guidelines described in Section 4.2. Only the western portion of Block G, the northern portion of Block H, and the central portion of Block I comply with the MOE guidelines for residential/parkland uses. The same areas plus Block J and large portions of Blocks D, E, L, and M comply with MOE guidelines for commercial/industrial land use (see Figure 4.2).

Elevated concentrations of various metals are commonly found across the site. This is not unexpected given the industrial activities that have occurred at Ataratiri. The original quality of the fill material deposited at the site may also have contributed to this condition.

Elevated concentrations of PAHs occur in much of Blocks A, K, NE, and the eastern portion of Block G. In most cases, the PAHs are likely due to past industrial activities. The concentrations measured in Block A are due to the former coal gasification plant that occupied much of the block until the 1960s. Examples of likely PAH sources in the other blocks include a paving company in Block K and a carbon products firm in Block G.

Elevated concentrations of PCBs are found in relatively few areas, often at scrap metal yards. Much of the soil contaminated with PCBs in those areas complies with the MOE guidelines for commercial/industrial land use but not with the guideline for residential/parkland.

It is estimated that approximately 274,000 m^3 of fill does not meet the residential/parkland guidelines, of which 223,000 m^3 does not meet the commercial/industrial guidelines. An additional 210,000 m^3 of fill has not been tested due to the inaccessibility of some areas.

Most of the underlying, native soil complies with the guidelines being used for Ataratiri. Elevated concentrations of some metals have been found in various locations across the site. Many of the elevated values were measured in samples from Blocks A, D, E, and K where the coal gasification plant, a metal foundry, and scrap metal yards are the likely sources. The only organic contamination in the native soil occurs in Block A (again due to the former coal gasification plant).

It is estimated that approximately 30,000 m^3 of native soil does not meet the residential/parkland guidelines, most of which (26,000 m^3), also does not meet the commercial/industrial guidelines. Approximately one-third of the native soils (by area) have not been tested due to the inaccessibility of some areas.

The relatively few samples taken of the underlying bedrock suggest that contamination has not reached the bedrock. Restricted access prevented the sampling of bedrock in Block A. Coal tar from the former coal gasification plant has been observed in the bedrock at properties near Ataratiri and it is suspected that similar conditions exist at Block A. It is estimated that approximately 50,000 m^3 of bedrock in Block A may contain elevated concentrations of PAHs.

4.6 Human Health Concerns Associated with Soil Quality

4.6.1 Current Limitations of Health Risk Assessments at Ataratiri

For future site users and those who live near Ataratiri, questions about health stem from the possible risks that may be posed by contaminants in the environment (principally the soil and groundwater). To examine this issue, it is necessary to understand the contaminants that are present, the ways that individuals might come into contact with contaminants, and the steps that can be taken to reduce or eliminate the risks.

Several factors limit the extent to which potential health risks related to soil quality at Ataratiri can be discussed. For example, soil clean-up guidelines have not yet been confirmed for all the contaminants of concern at Ataratiri, the specific remediation options to be used have not been selected, and the distribution of future land uses have not been finalized.

Given these limitations, it is premature to estimate health risks that Ataratiri soils may pose; however, a framework for assessing potential health risks has been developed that can be used as needed and when the necessary information becomes available. The basis and possible uses of the framework are outlined in the *Health Risks Issues Study of the Air, Soil and Groundwater Quality at the Ataratiri Site* (CanTox, 1991a).

The soil contaminants that will need to be included in the risk assessments are those identified in Section 4.5.2 as being of concern and any others that might be identified in the future. The health risks from the contaminants at the site will depend on the extent to which individuals will be exposed. The pathways of concern for future residents are slightly different than those for neighbours, and those for neighbours during remediation activities are slightly different than the pathways of concern after remediation. However, the pathways likely to be of concern most often to residents and neighbours include the inhalation of airborne dust particles and vapours, direct ingestion of soil or dust (particularly by children), and dermal (skin) contact with contaminated soil, dust, and vapours.

The prime objective of using the various options for the remediation is to either reduce or interrupt the potential exposure pathways and thereby prevent "unacceptable" health hazards. There are three basic ways this can be accomplished:

i) Remove the soils that contain elevated concentrations of contaminants from the site (e.g. excavate the areas of the site where the concentrations are too high and move the soil off-site).

ii) Remove the contaminants from the soils where concentrations exceed guidelines and leave the "cleaned" soils on the site (e.g. the soils on-site to remove the contaminants). For some of these options, there must also be acceptable ways of handling and disposing of the contaminants once they are removed from the soils.

iii) Interrupting the exposure pathway(s) (e.g. manage or treat the soils in such a manner that exposures can not occur even though the soils containing the contaminants remain on-site). These options must ensure that the interruption of the exposure pathways is permanent.

It is anticipated that human health concerns will need to be assessed and the results included in the documentation submitted with applications for approvals that must be received before many types of soil remediation activities can begin. As outlined in the following sections, these assessments may need to address not only the health concerns of future site users and site neighbours, but also the workers that perform the remediation activities.

A complex aspect of health risk assessment is determining what represents an "acceptable" level of risk. To resolve this question, the perceptions and expectations of individual citizens and of society as a whole need to be taken into consideration. (The issue of defining "acceptable" risk is also examined in Section 7.2.)

One way that science can assist in making decisions on "acceptable" levels of health risks is through comparative health risk assessments that involve the comparison between the potential exposures and hazards from chemicals in the area of concern (e.g. from the redeveloped Ataratiri site and those that occur in other situations with which the citizens involved may be familiar). The results of comparative assessments often are more easily understood than those using an absolute approach (e.g. an absolute risk level such as one-in-one hundred thousand is difficult to comprehend without a point of reference or comparison). Both the absolute and the comparative approaches should be used to assess risks at Ataratiri.

4.6.2 Concerns for Future Site Users

The future site users of the redeveloped Ataratiri site will include full-time residents (adults and children) and a variety of part-time users (e.g. workers living off-site, children attending schools on-site and living off-site, non-resident adults and children using parks and recreational facilities on-site). Full-time residents of the redeveloped Ataratiri site would have the greatest potential for exposures to contaminants from the site.

The health risks from the contaminants present at the redeveloped site will depend on the extent to which future users are exposed to the contaminants. The major exposure pathways for future residents to chemicals present in site soils include:

- inhalation of airborne dust particles arising from site soils;
- direct ingestion of soil or dust (particularly by children); and
- inhalation of chemical vapours arising from the site soils.

It is assumed that any gardening at Ataratiri will take place in areas where new top soil has been imported to the site. If specific areas are designated for gardening at Ataratiri, they will be located in the courtyards of buildings where the gardens will be separated from the underlying soil by underground parking structures. This would eliminate the possible exposure pathway of ingesting contaminants currently present in Ataratiri soils that could be taken up by plants.

Other pathways such as the ingestion of local groundwater and contamination of food products due to grazing or irrigation are not relevant for Ataratiri and have been eliminated from further consideration (CanTox, 1991a).

Though not a direct exposure pathway, it will also be necessary to consider contact with groundwater for management options that leave contaminated soils on the site. This is addressed further in Chapter 5.

4.6.3 Concerns for Workers During Remediation

The major concerns of workers cleaning up site soils will be potential exposures to chemical and materials released during remediation activities. Since the remediation processes will be applied to soils containing the highest levels of contaminants (these are the soils that require clean-up), workers performing the remediation will have a higher potential for exposure, although for a shorter time, than future users of the site.

The major pathways for exposure of workers to chemicals from soils during remediation include:

- inhalation of chemical vapours and dusts arising from the soils;
- skin contact with soils, dusts and vapours; and
- accidental direct ingestion of soils and dusts.

(Possible exposures arising from contact with contaminated groundwater or the inhalation of vapours from groundwater are addressed in Chapter 5.)

Various methods can be used to reduce or eliminate worker exposures. These include using protective equipment, monitoring concentrations of contaminants at the work site, worker education and training, and having a safety officer on-site to ensure that proper precautions are being taken. These steps (and others as needed) collectively represent a health and safety program.

The detailed health and safety program for each area of Ataratiri will need to reflect site conditions, the concentrations and toxicities of the contaminants present, and the remediation activities to be undertaken (some types of remediation use materials such as solvents which can pose risks to workers and site neighbours). The protective equipment or clothing to be used will be largely determined by the requirements of the Ontario Ministry of Labour (MOL). The health and safety programs should have the flexibility to make adjustments to suit conditions as they change.

4.6.4 Concerns for Neighbours

The health-related concerns of Ataratiri neighbours will be different during remediation from those after remediation. The primary exposure pathways of concern for site neighbours during remediation include:

- inhalation of chemical vapours or skin contact with vapours emitted from remediation activities; and

- inhalation of airborne dusts, swallowing inhaled dusts cleared from the lungs, and skin contact with airborne dusts generated during remediation activities.

(The possible contact with contaminated groundwater that might be spilled during an accident if off-site disposal is used for groundwater is addressed in Chapter 5.)

Exposures to neighbours during remediation would happen for a limited time and could be lessened by using various procedures at the work site to reduce off-site exposures such as keeping excavation surfaces damp, covering truck boxes with tarpaulins, and washing the tires of vehicles as they leave the site. Nevertheless, the potential exposures of neighbours will be assessed when an option being considered might produce atmospheric emissions.

Once remediation is completed, potential exposures for site neighbours arise from the possible off-site movement of contaminants via storm water runoff or groundwater transport. Movement via storm water runoff would only be possible if contaminated material was stored in such a way that it could come into contact with runoff. The requirements for storing some types of material such as PCB wastes are such that this should not occur. The possibility of groundwater transport would be an important consideration where contaminated soil is left in place or a treatment technology is used that mobilizes contaminants in groundwater. If these options are used at Ataratiri, specific assessments should be conducted to ensure that environmental transfers of contaminants to locations where site neighbours may be exposed are acceptable.

4.7 Remedial Options and Strategies for Ataratiri

4.7.1 Identifying Potential Options

In response to the many types of contaminants that can be present in soils, and the variability from site to site of other factors such as soil characteristics, numerous ways to manage contaminated soils have been used or are being developed. In general terms, the options can be grouped into three categories: those that involve off-site disposal, those that treat contaminants either by destroying them or separating them from soils, and those that manage contaminated soil on-site.

Published information has been assembled for 21 potential options (see Table 4.7) and a two-phase approach used to identify those most suitable for Ataratiri. In Phase I, the technological suitability of each option has been evaluated according to its ability to deal with the types of contaminants and conditions found at Ataratiri. This involved assessing the environmental behaviour of each contaminant and physical conditions at Ataratiri such as the location of the water table and various soil characteristics. The options listed in

Table 4.7

SOIL REMEDIATION OPTIONS EXAMINED FOR ATARATIRI

off-site disposal - hazardous waste facility
- soil that is classified as hazardous waste is excavated and transported to an approved hazardous waste facility; waste owner must become registered with the MOE as a waste generator and follow proper transportation procedures
- hazardous waste facilities will accept soils with inorganic and organic contaminants but can not accept soil with >50 ppm PCB
- by-products, such as dust and/or vapours resulting from excavation of the soil, may be associated with this option

off-site disposal - municipal landfill
- non-hazardous waste is excavated and transported to a municipal landfill; owner of non-hazardous waste may need to become waste generator
- municipal landfills will accept soils with inorganic and organic contaminants but this option is not suitable for hazardous wastes
- by-products, such as dust and/or vapours resulting from excavation of the soil, may be associated with this option

off-site disposal - licensed industrial landfill
- mildly-contaminated soils are excavated and transported to an approved industrial landfill
- licensed industrial landfills will accept soils that are mildly contaminated with inorganic and organic chemicals
- by-products, such as dust and/or vapours resulting from excavation of the soil, may be associated with this option

bioremediation - in situ
- water, carrying nutrients, oxygen and biological organisms, is circulated through contaminated soils until the soil is determined to be clean; does not require soil excavation; can not effectively treat soils above the water table
- suitable for organic contaminants only; can not treat metal contamination
- by-products include inorganic substances such as carbon dioxide and water

Table 4.7 (continued)

bioremediation - ex situ (or bioreactor)

- soil is excavated and placed in a containment area; oxygen, water and nutrients are added to create or enhance the microbial degradation process until the soil is determined to be clean
- suitable for organic contaminants only; can not treat metal contamination
- by-products include inorganic substances such as carbon dioxide and water, as well as dust and/or vapours resulting from excavation of the soil; may need air emission controls

bioventing

- soil venting or vacuum extraction is used to transfer oxygen to the subsurface to enhance aerobic biodegradation of the soil contaminants
- suitable for biodegradable organic contaminants only; can not treat metal contamination
- by-products include inorganic substances such as carbon dioxide and water; may need air emission controls

incineration/thermal treatment

- soil is excavated and passed through a high temperature incinerator
- destroys organic contaminants only; does not destroy metals
- by-products include ash or effluent that may require treatment, as well as dust and/or vapours resulting from excavation of the soil; air emissions are a major source of public concern

solidification

- soil is excavated and a cement-like mixture is added to minimize mobility of contaminants; contaminants are not removed or destroyed; solidification acts to reduce leachability; on-going monitoring of soil is required; solidified material may need to be disposed off-site
- generally only applicable to inorganics
- by-products, such as dust and/or vapours resulting from excavation of the soil, may be associated with this option

vitrification

- an electrical current is used to heat the soil to create a glass-like material; contaminants are not removed or destroyed; vitrification acts to reduce leachability; on-going monitoring of soil is required; vitrified material may need to be crushed and disposed off-site
- mostly suitable for inorganics
- if vitrified material is excavated, by-products such as dust and/or vapours may be associated with this option; may need air emission controls

Table 4.7 (continued)

microencapsulation

- a form of stabilization which immobilizes contaminants on a microscopic scale; contaminants are not removed or destroyed; on-going monitoring of soil is required
- suitable for organics and some heavy metals, depending upon the microencapsulation process used; not effective for most inorganic contaminants
- by-products such as vapours may be associated with this option; may need air emission controls

volatilization/soil aeration

- air is passed through soil to draw out volatile contaminants; works best in permeable soils above the water table
- generally only suitable for volatile organic contaminants
- by-products such as vapours may be associated with this option; air emissions require control

soil washing/chemical extraction

- soil is excavated and washed to remove contaminants from the soil; liquids used to wash the soil may be toxic, flammable, and/or corrosive; removes, rather than destroys, contaminants
- can be used to remove both organic and inorganic contaminants
- by-products include liquid wastes to be managed, as well as dust and/or vapours resulting from excavation of the soil

soil flushing - in situ leaching

- washing liquids are circulated through the soil to separate contaminants from the soil; liquids used to wash the soil may be more toxic than the contaminants; removes, rather than destroys, contaminants
- can be used to remove both organic and inorganic contaminants
- by-products include liquid wastes to be managed

metal chelation

- soil is excavated and washing liquids are used to remove metals; metals are removed through a chemical bonding process; originally developed for use in the mining and metal plating industries
- not suitable for organics
- by-products such as the chelated metals in the liquid medium may require management; dust and/or vapours may result from excavation of the soil

Table 4.7 (continued)

dechlorination/chemical destruction

- excavated soil is mixed with a reagent containing sodium
- designed to remove PCBs; does not remove most other types of organic or inorganic contaminants
- by-products include liquid wastes to be managed, salt, and hydrocarbon residues, as well as dust and/or vapours resulting from excavation of the soil

electro-acoustics

- electrodes are placed in the soil; both a DC electric field and an acoustic field are applied to the contaminated soil; contaminants migrate to the cathode where they are concentrated and removed
- treats inorganic contaminants only
- no by-products are known to be associated with this option; soil close to the cathode in which the contaminants are concentrated must be managed

low temperature thermal desorption

- excavated soil is passed through a heated chamber to drive off volatile contaminants; contaminants are then incinerated
- suitable for volatile and semi-volatile organic compounds; not effective on metals
- by-products, such as ash, may require management, as well as dust and/or vapours resulting from excavation of the soil; air emissions may require control

on-site re-use

- soil meeting industrial land use guidelines is excavated and moved to an area of the site which will be used for industrial purposes
- suitable for soils that meet industrial guidelines for inorganic and organic substances
- by-products, such as dust and/or vapours resulting from excavation of the soil, may be associated with this option

on-site storage

- soil is placed in a secure area or structure; commonly used for PCB contaminated soil; regular inspection of the secure area or structure is required
- suitable for inorganics and/or organics
- by-products, such as dust and/or vapours resulting from excavation of the soil, may be associated with this option

Table 4.7 (continued)

isolation

- soil is placed in locations where it is covered by clean soil, buildings, asphalt, concrete, etc.; physical barriers may be needed to limit contact with contaminated soil and to restrict the movement of the contaminants through the soil; on-going monitoring of soil is required
- suitable for inorganics and/or organics (other than volatile organic contaminants) that have been demonstrated to be unlikely to move through the soil
- by-products, such as dust and/or vapours resulting from excavation of the soil, may be associated with this option

planning considerations

- uses of areas of a site are guided by the distribution of contaminants
- suitable for areas of a site which meet soil quality guidelines
- no by-products are associated with this option

Table 4.8

SOIL MANAGEMENT OPTIONS RECOMMENDED FOR FURTHER STUDY

Options For Managing Organic Contaminants Only

bioremediation (*in situ* and *ex situ*)
storage

Options For Managing Inorganic Contaminants Only

metal chelation

Options For Managing Organic and Inorganic Contaminants

off-site disposal (hazardous waste disposal facility, municipal landfill, or licensed industrial fill site)
soil washing
physical/chemcial solidification and stabilization
microencapsulation
reuse
on-site isolation
planning considerations

Table 4.8 have been judged to be suitable and, therefore, pass to Phase II for further evaluation.

The objective of Phase II is to evaluate each option according to whether it eliminates, reduces, or increases the potential for future site users or neighbours to be exposed to soil contamination, and whether the option eliminates, reduces, or increases the ability of any residual soil contamination to move around in the environment.

Because Ataratiri-specific information is not yet available for Phase II, it is premature to eliminate any of the options that have passed Phase I. It is anticipated that bench scale and/or pilot scale tests will be undertaken for some of the options that have passed Phase I. The results of those tests will provide site-specific information that can be used for Phase II. Accordingly, all options that have passed Phase I (as well as any new options that pass Phase I at a later date) are possible candidates for bench scale or pilot scale testing. In preparing detailed remediation plans, it is anticipated that health risks will be assessed to improve Phase II evaluations.

4.7.2 The Preferred Soil Management Strategy

On the basis of the contaminants of concern, the estimated volumes of material that will need to be addressed, the characteristics and capabilities of the options that passed Phase I, and regulatory requirements, an overall preferred soil management strategy has been prepared for Ataratiri.

This strategy divides the soil at Ataratiri into five broad categories, four of which are based on chemical characteristics (A through D), assigns a volume to each category, and identifies one or two possible options for managing each category. At this broad level of plan development, specific conditions that might be present in a particular area can not be taken into account (see Section 4.7.3). Caution should be used in multiplying the volumes by the units costs and summing the costs for all categories because there is some overlap among the soil volumes estimated for each category.

Category A includes all soil that contains more than 25 μg/g of PCB. It is estimated that 4,000 m^3 of soil are in this category. This material will likely be stored on-site in a secured storage facility that complies with the requirements of Regulation 11/82. (This is the case with all PCB waste in the Province until approved treatment options become available). The cost of managing this material is estimated to be $600 to $1,100 per m^3.

Category B includes the 2,000 m^3 of leachate toxic soil that has already been identified and could include another 11,000 m^3 of soil. The preferred approach is to treat this material so that it meets clean-up guidelines (or at least is no longer classified as leachate toxic); however, if it is not possible to treat this material, it will be necessary to dispose it at an appropriately licensed facility. The cost of disposing leachate toxic material is approximately $700 per m^3.

Category C includes all of the soil that has contaminants that exceed residential soil guidelines by a factor of more than five. The factor of five has not been finalized and is presented here for discussion purposes only but experience has shown that such material would not be classified as registerable waste and that the contaminants should have limited potential to leach into groundwater. If this approach is used, the factor of five will need to be refined (i.e by using some combination of environmental fate and risk assessment procedures) and could vary from contaminant to contaminant. There is an estimated 114,000 m^3 of soil in this category. It is anticipated that treatment procedures can be used to make this soil reusable at Ataratiri. The cost of managing Category C soil is estimated to be in the range of $145 to $300 per m^3 depending on whether the contaminants that are present require one or two types of treatment.

Category D includes all of the soil that has contaminants that exceed residential soil guidelines by less than a factor of five. There is an estimated 354,000 m^3 of soil in this category at Ataratiri. Soil in Category D may be suitable to remain on-site depending on where it is located and the potential for the contaminants to migrate. For example, the 127,000 m^3 of soil that exceeds residential guidelines but meets industrial/commercial guidelines would be suitable to remain on parts of the site intended to be used for commercial purposes or under roads. The soil may also be suitable to remain below foundations where it will not come into contact with future site users. Environmental fate and risk assessment procedures would need to be used to demonstrate the appropriateness of this approach. The cost of managing Category C soil is estimated to be approximately $30 per m^3. Category D soil found to be unsuitable for remaining on-site untreated would become Category C material.

Category E includes the net surplus of approximately 364,000 m^3 of soil that will need to be excavated and removed off-site to accommodate all of the foundations and underground structures planned for Ataratiri after the fill that is required for floodproofing has been taken into account. Soil in this category may include clean soil or soils from Categories B, C, or D. Soil in Category E may be reused at other sites, taken to lakefill (if it meets the appropriate guidelines), or taken to a licensed industrial fill site. The disposal costs associated with this option are estimated to be $30 per m^3.

Based on the types of management activities that may be required for each of the soil management categories described above, the volumes of soil in each category, and the highest unit costs estimated for each category, total costs have been estimated (see Table 4.9) for three possible scenarios:

- Scenario 1 assumes that all soil which exceeds the residential soil guidelines by less

Table 4.9

SOIL CLEAN-UP COST ESTIMATES

		Option 1[a]		Option 2[b]		Option 3[c]	
Category	Unit Cost ($\$/m^3$)	Volume m^3	Cost \$Million	Volume m^3	Cost \$Million	Volume m^3	Cost \$Million
A	1,100	4,000	4.4	4,000	4.4	4,000	4.4
B	700	2,000	1.4	2,000	1.4	1,300	9.1
C	300	114,000	34.2	341,000	102.3	457,000	137.0
D	30	354,000	10.6	127,000	3.8	0	0
E	30	364,000	10.9	364,000	10.9	364,000	10.9
Totals			61.5		122.8		161.4

NOTES:

[a] assumes all soil that has levels of contaminants that exceed residential soil guidelines by less than a factor of five will be suitable to remain on site.

[b] assumes all soil that has levels of contaminants that exceed residential soil guidelines but meet industrial/commercial guidelines will be suitable to remain on site

[c] assumes that no soil that exceeds residential guidelines will be suitable to remain on site

than a factor of five will be suitable to remain on site. The total cost for Scenario 1 is estimated to be $61.5 million.

- Scenario 2 assumes that all soil that exceeds the residential soil guideline but meets the industrial/commercial guidelines will be suitable to remain on-site. The total cost for Scenario 2 is $122.8 million.
- Scenario 3 assumes that all soil which exceeds the guidelines will be excavated and removed from the site or treated to remove or immobilize the contaminants. The total cost for Scenario 3 is $161.4 million.

These cost estimates will be refined further as the results of bench and pilot scale testing become available and once a decision has been made on the acceptability of allowing soil which exceeds the guidelines to remain on-site.

While the strategy outlined above takes into account information about site conditions, and the capabilities of remediation options, there is little in the way of other strategies against which it can be compared in terms of thoroughness or appropriateness. There are no published accounts of strategies being prepared (or approved) for other Ontario sites as big as Ataratiri and containing the range of contaminants found at Ataratiri. As a result, the strategy developed for Ataratiri will likely set an example for other large, complex sites.

Some elements of the preferred strategy are relatively commonplace such as the proposal to store the Category A material on the site and the proposed treatment and/or off-site disposal of Category B material, however, other elements such as the proposal to leave on-site material which is unlikely to present undue health risks to future site residents are not common, although there are documented examples where this approach has been used (TDM, 1991a). Before the proposal to manage Category D material on-site is recommended for use at Ataratiri, environmental fate modelling and risk assessment procedures will need to be carried out to demonstrate the appropriateness of this approach.

The proposal to leave soil that exceeds guidelines on-site is contrary to the policies of the MOE which considers the approach to be equivalent to establishing a waste disposal on the site and, therefore, would require that approvals to be issued under Part V of the EPA. A hearing would be part of the approval process and the presence of the material would need to be registered on title. Furthermore, the MOE has indicated that buildings and roads can not be built on sites issues Part V approvals. Land uses such as parks or other recreational spaces may be acceptable but the soils would need to be totally contained.

A key technical component in the arguments for and against leaving Category D soil on-site, concerns how the guidelines being recommended for surface soils at Ataratiri should be applied to contaminants at different depths.

Due to the potentially high cost associated with cleaning-up all of the contaminated soil at the Ataratiri site, and the importance of making clean-up decisions that are fully protective of the environment and human health, consideration should be given to allowing soil which does not present undue human health and environmental risks to remain on site under controlled conditions. Health risk assessment and environmental fate modelling should be carried out before a decision is made as to the acceptability of this option.

These studies should be carried out in consultation with MOE and the results incorporated into the detailed soil and groundwater management plans that will be prepared for each area of the site as required by condition 3 of the Exemption Order. Condition 3 anticipates that this issue will be addressed by requiring that the detailed soil and groundwater quality management programs identify 'if contaminated soil should be removed'.

4.7.3 Finalizing the Management Plan

The information gathered to date for Ataratiri is suitable for characterizing soil conditions on a broad basis. Before detailed soil management plans can be finalized for each area of the site, numerous area-specific conditions will need to be taken into account. It is anticipated that these conditions will be evaluated by conducting any or all of the following studies:

- investigating areas previously not sampled to improve the understanding of the contaminants present, their physical form(s), and extent;
- conducting bench scale tests to determine the effectiveness of specific options, identify any adjustments needed to maximize treatment efficiency, estimate potential environmental releases of full-scale facilities, and estimate treatment costs; and
- investigating specific subsurface characteristics needed in conjunction with the bench scale studies.

With the information generated by such studies, it will be possible to improve the Phase II assessment of options and make decisions as to which options are genuine candidates for pilot scale testing. If it is decided to proceed to pilot scale or full scale applications, the information noted above would be supplied to the MOE as part of the approval process.

Once detailed soil and groundwater management plans for each area of the site have been approved by appropriate regulatory agencies, soil management activities can begin. For all of the site, soil remediation activities will need to be coordinated with groundwater remediation activities (see Chapter 5).

For the eastern portion of Ataratiri, soil remediation activities will need to be coordinated with flood protection (grade raising) activities (see Chapter 6). The need to raise grades also presents some opportunities to cover mildly contaminated soil with up to several metres of clean soil. This would greatly reduce the ability of future site users to come into contact with the contaminants and further illustrates the need to determine how the soil guidelines being recommended for surface soils at Ataratiri should be applied to contaminants at different depths (as noted in Section 4.7.2).

Since the remediation will occur in phases (i.e. the entire site will not be remediated all at once), there will be a need to minimize (or eliminate) situations in which future residents are living adjacent to sites where remediation activities are underway. One option may be to use nearby, City-owned sites (such as 480 Lakeshore Boulevard East) for the temporary storage or treatment of soils. other

4.7.4 Soil Management Priorities

From the perspective of overall soil management at Ataratiri, priority should be given to blocks where the most serious contamination occurs and/or where the contamination could spread elsewhere. Accordingly, the following conditions at Ataratiri should be addressed at an early stage of site remediation:

- Block A should be addressed at an early stage of redevelopment due to the presence of PAH contamination in the fill and native soils. The bedrock in the block is also likely to be contaminated.

- Block NE should also be addressed at a relatively early stage due to the presence of elevated concentrations of PAHs.

- Within individual blocks or parcels, soils classified as PCB waste, leachate toxic material, or localized "hot spots" should be managed before less-contaminated material is addressed.

- Any underground storage tanks should be emptied and removed at the beginning of remediation activities at a sub-area or parcel.

The movement of contaminants via groundwater is a concern in several parts of the site and at Block P. The control of contaminant migration (see Section 5.8.2) needs to be coordinated with soil remediation activities.

It is recognized that other factors may intercede such as the need for flood protection or the need to control costs. Remediation of even the most contaminated areas does not have to take priority over other activities provided that adequate precautions are taken to prevent contaminants from spreading.

4.7.5 Pre-Clean-up Aspects of Site Management

The demolition of buildings at Ataratiri and the removal of underground storage tanks are two activities, that if done improperly, can lead to further soil contamination and interfere with other aspects of site management.

During demolition, care must be taken to protect workers and the public, handle special materials, and prevent contamination of site soil. Environmental concerns generally associated with demolition include the presence of electrical equipment that contains PCBs, the presence of asbestos-containing material, and the presence of residual wastes (liquid or solid) present in drums, tanks, or pits. Specifications are being established for demolition contractors that require the proper handling of wastes, protect workers and neighbouring site users, specifying the disposal options for materials that can not be salvaged or recycled, and establishing the quality of any soils to be brought onto the site.

Programs will need to be implemented that set out procedures for handling and disposal of the tanks and any residual liquids or sludges in the tanks. The programs will also describe how soil contaminated by leaking tanks is to be managed. This will be done in consultation with relevant regulatory agencies such as the Fuels Safety Branch of the Ministry of Consumer and Commercial Relations (MCCR) and the MOE. The Toronto Fire Department will also be consulted to ensure that a high level of fire protection is available if needed.

4.8 Recommendations for Further Studies

Further work is needed before detailed soil management plans can be finalized. These efforts include further sampling of soil quality in selected areas, bench scale and/or pilot scale testing of some treatment options, and where necessary, assessing the health risks associated with some aspects of soil remediation plans. Specific recommendations include:

- Additional soil sampling is required to improve the definition of contaminated soil in several areas of the site and to sample areas previously not accessible. Once properties have been vacated and/or demolished, areas beneath the buildings can be investigated. Some parts of the site have not been tested due to restricted access. The largest gaps in existing soil information concern several scrap metal yards and service stations in operation when past monitoring efforts were undertaken, parts of Block A, and beneath existing building structures.

- Bench and/or pilot scale tests are needed to confirm the effectiveness of some options. These tests will also assist in estimating the costs and time required to implement an option, as well as design the treatment equipment. Additional information on soil characteristics will need to be collected in conjunction with the tests.

- It is recommended that a health risk assessment be conducted for the redeveloped Ataratiri site once all of the soil clean-up guidelines and future land uses have been approved and a soil management plan has been developed. The risk assessment will assist in determining the acceptability of contaminant concentrations that will remain.

- The issue of how soil guidelines should be applied differently to contaminants at depth should be addressed as the soil management plans for each area of the site are being finalized.

- Assessment should be made of remediation options for isolating or storing soils to ensure the appropriateness of these options with respect to the potential health risks and to demonstrate that any migration of contaminants into the surrounding environment will not cause adverse effects.

- Site-specific health and safety programs will be developed in conjunction with the MOL. The programs should have enough flexibility to suit conditions as they change.

- Specifications will be established for demolition contractors that require the proper handling of wastes, protect workers and neighbouring site users, specify the disposal options for materials that can not be salvaged or recycled, and establish the quality of any materials brought onto the site.

- Programs will be established that address the removal of underground storage tanks, the handling and disposal of residual liquids or sludges they contain, and the management of soil contaminated by leaking tanks. This should be done in consultation with relevant regulatory agencies such as the Fuels Safety Branch of the MCCR and the MOE.

5.0 GROUNDWATER AND STORM WATER QUALITY

5.1 Overview

The same sources that can cause soil contamination at Ataratiri (a history of industrial activities and the quality of fill materials), can adversely affect local groundwater and/or storm water. Given the interrelationships among soil quality, groundwater quality, and storm water quality, a plan to manage any one of these environmental components must take the others into account.

Condition 2 of the Exemption Order requires the EES report to identify key concerns associated with groundwater and storm water quality. Condition 2 further requires that the EES report shall contain an overview of existing soil and groundwater quality conditions and propose soil and groundwater management for the site. Condition 3 requires a detailed soil and groundwater management be developed for each area of the site.

Shortly after the Exemption Order was granted, investigations were begun to identify the extent of environmental contamination and to provide an overview of groundwater quality. These investigations were undertaken in conjunction with the soil investigations noted in Section 4.1 by the same three firms (MacLarentech, 1989; Proctor & Redfern, 1989; M.M. Dillon, 1988). While samples of groundwater were not analyzed for specific parameters during those preliminary investigations, aesthetic inspections of samples indicated that groundwater was contaminated in portions of the site.

In 1989, the City retained Trow, Dames & Moore (TDM) to undertake additional tasks related to groundwater and storm water quality at Ataratiri:

- consolidate and review the findings of the previous three investigations;
- design and implement studies to describe more accurately the nature and extent of groundwater and storm water contamination; and
- provide a basis for developing comprehensive remedial action strategies.

This chapter summarizes the findings reported by TDM (1991b). It includes a review of relevant criteria and guidelines, a brief description of physical site characteristics related to groundwater, a summary of the ground and storm water quality investigations that have been undertaken, an outline of the health issues related to ground and storm water quality, a review of potential remediation options, a description of the overall ground and storm water management plan, and recommendations for further studies.

Table 5.1

FEDERAL AND PROVINCIAL WATER QUALITY GUIDELINES

Parameter	CDWQG	ODWQO	PWQO
ammonia (unionized)	---	---	0.02 mg/L
arsenic	0.05 mg/L	0.05 mg/L	0.1 mg/L total
barium	---	1.0 mg/L	---
boron	5.0 mg/L	5.0 mg/L	---
beryllium	---	---	0.011 to 1.1 mg/L total
cadmium	0.005 mg/L	0.005 mg/L	0.0002 mg/L total
chlorides (as Cl)	250 mg/L	250 mg/L	---
chlorine (total residual)	---	---	0.002 mg/L
chromium	0.05 mg/L	0.05 mg/L	0.1 mg/L total
copper	1.0 mg/L	1.0 mg/L	0.005 mg/L total
cyanide (free)	---	0.2 mg/L	0.005 mg/L
cyanide (total)	0.2 mg/L	---	---
fluorides (as F)	1.5 mg/L	2.4 mg/L	---
hydrogen sulphide	---	---	0.002 mg/L
iron	0.3 mg/L	0.3 mg/L	0.3 mg/L total
lead	0.01 mg/L	0.05 mg/L	0.005 to 0.025 mg/L total
manganese	0.05 mg/L	0.05 mg/L	---
mercury	0.001 mg/L	0.001 mg/L	0.0002 mg/L filtered
nickel	---	---	0.025 mg/L total
nitrate (as N)	10.0 mg/L	10.0 mg/L	---
nitrite (as N)	1.0 mg/L	1.0 mg/L	---
organic nitrogen	---	0.15 mg/L	---
PCBs	---	0.003 mg/L	0.000001 mg/L total
pH	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5
phenols	---	0.002 mg/L	0.001 mg/L total
phosphorus	---	---	0.01 to 0.03 mg/L
selenium	0.01 mg/L	0.01 mg/L	0.1 mg/L total
silver	---	0.05 mg/L	0.0001 mg/L total
sulphates (as SO_4)	500 mg/L	500 mg/L	---
total dissolved solids	500 mg/L	500 mg/L	<30% increase
total organic carbon	---	5 mg/L	---
trihalomethanes	0.35 mg/L	0.35 mg/L	---
turbidity	---	1 Formazin Unit	<10% decrease
uranium	0.1 mg/L	0.02 mg/L	---
zinc	5 mg/L	5 mg/L	0.03 mg/L total

Note:

The PWQO also contain qualitative requirements that address issues such as temperature, colour, odours, methane, and viscosity. There are PWQO values for about 25 pesticides and herbicides and four industrial organic compounds.

5.2 Relevant Criteria and Guidelines

5.2.1 Federal

Federal agencies offer relatively little information regarding criteria or guidelines that apply specifically to groundwater or storm water quality. Interim guidelines have been recommended for nine polycyclic aromatic hydrocarbons (PAHs) in groundwater at abandoned coal tar sites (CCREM, 1988). These limits are based in large measure on "a best-guess, pragmatic approach" and their suitability for use at Ataratiri is unclear.

Canadian drinking water quality guidelines (CDWQG) have been developed for a wide range of parameters and are intended to be used to assess both public and private drinking water supplies, including those from groundwater sources (CCME, 1990). Table 5.1 summarizes the CDWQG values.

5.2.2 Provincial

Currently no provincial guidelines exist for evaluating groundwater at sites being redeveloped. In principle, the MOE requires remedial action wherever contaminants are present at concentrations above ambient (background) levels. The MOE identifies three basic options for developing numerical clean-up guidelines for groundwater:

- apply relevant MOE policies and guidelines;
- apply clean-up criteria developed in other jurisdictions, where appropriate; and
- develop and apply site-specific guidelines.

The MOE policies that can be used to establish clean-up guidelines for groundwater include:

- provincial water quality objectives (PWQO) may be applicable if contaminants are reaching surface waters such as a river or lake via groundwater (MOE, 1984);
- the Ontario drinking water quality objectives (ODWQO) may be applicable if contaminants are present in local groundwater which is used as a drinking water source (MOE, 1984); and
- the MOE Model Sewer Use By-Law may be applicable if contaminants are reaching the local sewer system.

Table 5.1 summarizes the PWQO and ODWQO values.

To use clean-up guidelines or criteria from another jurisdiction (the second option), the method used to derive those values must be consistent with the MOE goal of establishing criteria that are fully protective of human health and the environment. Relatively few agencies in Canada have recommended groundwater quality guidelines.

One of the more comprehensive sets of guidelines in Canada are those issued by the Québec Ministère de l'Environnement (MENVIQ). Three levels have been established by MENVIQ for more than 90 substances, including several types of organic compounds. Table 5.2 lists these for various organic compounds including PAHs and VOCs.

The third option allows the party responsible for the decommissioning or clean-up of a property to take the initiative and develop site-specific guidelines. The factors that should be considered during such efforts are similar to those of interest when establishing soil guidelines: environmental behaviour of contaminants, the pathways by which contaminants may impact on human health or the environment, anticipated future uses of the site, surrounding land uses, physical features and environmental conditions of the site, background concentrations of contaminants, and aesthetic considerations. Site-specific groundwater quality guidelines have not been developed for sites in Ontario.

5.2.3 Municipal

The Metropolitan Toronto Sewer Use By-Law 153-89 defines the quality of water that can be discharged to storm and sanitary sewers. It is based on the MOE Model Sewer Use By-Law. The sanitary sewer discharge limits are intended to be applied to domestic and industrial sewage. The sanitary sewer guidelines address more parameters but are less stringent than the guidelines for storm sewers. These values are summarized in Table 5.3.

The guidelines can be used to evaluate the quality of storm water at Ataratiri and the quality of groundwater if it is assumed that the groundwater might need to be discharged to the sewer system (a common practice at excavation sites).

5.2.4 Guidelines Applied to Ataratiri

Given the lack of directly applicable guidelines for assessing groundwater quality at Ataratiri, an approach was developed that uses many of the guidelines, objectives, and criteria described in Sections 5.2.1 through 5.2.3 and by using "background" conditions (determined by the quality of groundwater that flows onto Ataratiri along the northern perimeter).

The results are first compared to the CDWQG, PWQO, and ODWQO. Because groundwater in this area of Toronto typically does not comply with all of these guidelines, non-complying Ataratiri results can not be interpreted to mean that remediation is necessary (or would be very effective) but this initial comparison can be used to identify parameters that require evaluation.

Table 5.2

SELECTED GROUNDWATER GUIDELINES RECOMMENDED BY MENVIQ

	Groundwater Guideline* (ug/L)		
	A	B	C
MONOCYCLIC AROMATIC HYDROCARBONS			
benzene	0.5	1	5
ethylbenzene	0.5	50	150
toluene	0.5	50	100
chlorobenzene	0.1	2	5
1,2-dichlorobenzene	0.1	2	5
1,3-dichlorobenzene	0.1	2	5
1,4-dichlorobenzene	0.1	2	5
xylene	0.5	20	60
styrene	0.5	40	120
PHENOLIC COMPOUNDS			
non-chlorinated (each)	1	3	20
chlorophenols (each)	1	2	5
chlorophenols (total)	1	4	10
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)			
acenaphthene	0.5	20	30
acenaphthylene	0.5	10	20
anthracene	0.2	7	20
benzo[a]anthracene	0.1	0.5	2
benzo[a]pyrene	0.1	0.2	1
benzo[b]fluoranthene	0.1	0.2	1
benzo[c]phenanthrene	0.1	0.5	2
benzo[g,h,i]perylene	0.1	0.2	1
benzo[j]fluoranthene	0.1	0.2	1
benzo[k]fluoranthene	0.1	0.2	1
chrysene	0.1	1	5
dibenzo[a,h]anthracene	0.1	0.2	1
dibenzo[a,h]pyrene	0.1	1	5
dibenzo[a,i]pyrene	0.1	1	5
dibenzo[a,j]pyrene	0.1	1	5

Table 5.2 (Continued)

	Groundwater Guideline* (ug/L) A	B	C
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)			
7,12-dimethylbenz[a]anthracene	0.1	0.2	1
fluoranthene	0.1	2	10
fluorene	0.1	2	10
indeno[1,2,3-c,d]pyrene	0.1	1	5
3-methylcholanthrene	0.1	0.2	1
naphthalene	0.2	10	30
phenanthrene	0.1	1	5
pyrene	0.2	7	30
PAHs (total)	0.2	10	50
CHLORINATED HYDROCARBONS			
aliphatics (each)	1	10	50
aliphatics (total)	1	15	70
chlorobenzenes (each)	0.3	2	5
chlorobenzenes (total)	0.3	4	10
hexachlorobenzene	0.1	0.5	2
PCBs	0.1	0.2	1
INDICATOR PARAMETERS			
phenolics (colorimetric)	1	2	5
gasoline	1000	1500	3000
mineral oil and grease	100	1000	5000

Notes:

* less than A - background or ambient conditions
A to B - slightly contaminated, groundwater criteria satisfied
B to C - contaminated; groundwater not suitable for drinking
greater than C - seriously contaminated; ground water not suitable for drinking

These guidelines also address numerous metals, minerals, and pesticides.

Table 5.3

METRO TORONTO SEWER BY-LAW GUIDELINES

Parameter	Discharges to Sanitary Sewers	Discharges to Storm Sewers
aluminum	50 mg/L	
antimony	5 mg/L	
arsenic	1 mg/L	
bismuth	5 mg/L	
biochemical oxygen demand	300 mg/L	15 mg/L
cadmium	1 mg/L	0.001 mg/L
chlorides (as Cl)	1500 mg/L	
chromium	5 mg/L	0.2 mg/L
cobalt	5 mg/L	
copper	3 mg/L	0.01 mg/L
cyanide (total)	2 mg/L	
fluorides (as F)	10 mg/L	
iron	50 mg/L	
Kjeldahl nitrogen	100 mg/L	
lead	5 mg/L	0.05 mg/L
manganese	5 mg/L	
mercury	0.1 mg/L	0.001 mg/L
molybdenum	5 mg/L	
nickel	3 mg/L	0.05 mg/L
PCBs	absent	absent
pH	6.0 to 10.5	6.0 to 9.0
phenolic compounds	1 mg/L	
phosphorus	10 mg/L	
selenium	5 mg/L	
silver	5 mg/L	
solvent extractable - natural	150 mg/L	
solvent extractable - synthetic	15 mg/L	
sulphates (as SO_4)	1500 mg/L	
suspended solids	350 mg/L	15 mg/L
temperature	65•C	40•C
tin	5 mg/L	
titanium	5 mg/L	
vanadium	5 mg/L	
zinc	3 mg/L	0.05 mg/L

Note:
The guidelines contain other requirements that address issues such as odours or viscosity and prohibit various materials including paints, organic solvents, PCBs, and pesticides.

For parameters that frequently exceed (>5% of the samples analyzed) any of the three sets of guidelines, it is necessary to compare concentrations measured at Ataratiri with those in the groundwater that enters Ataratiri to determine if groundwater quality changes as it passes beneath Ataratiri. Relatively higher concentrations of contaminants in the groundwater at Ataratiri than in groundwater that enters Ataratiri is interpreted as indicating a need to treat Ataratiri groundwater for each of the parameters seen to increase.

For parameters not addressed by any of the three sets of guidelines, the MENVIQ Level B values are used. (MENVIQ indicates that groundwater remediation is needed when Level B values are exceeded if the groundwater is used as a drinking water supply). For evaluating groundwater and storm water quality at Ataratiri, exceedence of Level B values is interpreted as an indicator that further investigation is necessary and remediation may be required.

Concentrations measured in groundwater and storm water at Ataratiri also are compared to the Toronto Sewer Use By-Law to indicate whether the water can be discharged directly to the local sewer system, if some form of treatment is required before being discharged, or if off-site disposal should be considered.

5.3 Potential Sources of Groundwater Contaminants

Most of the types of land uses and activities described in Section 4.3 are potential sources of groundwater contaminants. Of particular concern, from the perspective of groundwater quality, are the coal gasification facilities in Block A.

Underground storage tanks often are sources of groundwater contamination. Section 4.3.2 lists the locations of storage tanks identified to date at Ataratiri.

Lands located between the Ataratiri site and Block P formerly were used for storing petroleum products. This area may be a source of groundwater contamination at Block P. There is no evidence of other off-site sources of groundwater contaminants at Ataratiri.

5.4 Physical Characteristics

5.4.1 Groundwater Flow in the Overburden

Two components can be identified to overburden groundwater in Ataratiri. These roughly correspond to the two layers of soils described in Section 4.4. The "shallow" water table occurs in the fill layer. The depth of the shallow water table typically was in the range of

0.5 to 3.0 m below the ground surface during the field investigations in 1988 and 1989.

East of Cherry Street, the direction of shallow groundwater flow is southeast towards the Don River. West of Cherry Street, flow is partially to the southwest, but there also is a northerly component to the flow. Shallow groundwater flow patterns have been disrupted in many locations by sewers and other buried utility lines which can act as preferred flow routes. It is estimated that "shallow" groundwater moves laterally at a rate of several metres per year.

Groundwater in the native soils is referred to as "deep" groundwater. The level of groundwater in this layer is referred to as the potentiometric surface. East of Cherry Street, the direction of deep groundwater flow is to the east and southeast, towards the Don River. West of Cherry Street, there is a northerly component of the flow which makes its way towards the Don River. The remaining portion of the flow is to the southwest and south, towards Lake Ontario.

The silty clay till which makes up most of the native soils slows the vertical movement of groundwater and contaminants in the groundwater from the upper fill layer to the underlying bedrock. It is estimated that the "deep" groundwater moves laterally at a rate of several millimetres per year.

5.4.2 Groundwater Flow in the Bedrock

Based on observations made at six monitoring wells, the groundwater within the fractured bedrock that underlies the site appears to flow to the east and south. This flow pattern conforms to the general slope of the bedrock surface.

5.5 Groundwater Quality Investigations

5.5.1 Monitoring Programs

Each of the three preliminary investigations of groundwater involved installing groundwater monitoring wells. At approximately 90 locations across Ataratiri and Block P, the elevation of the groundwater table was recorded and samples were inspected for obvious signs of contamination such as odour, discoloration, or sheen.

The fourth investigation (by TDM) included collecting samples from 39 of the existing wells in Ataratiri and three in Block P. Most of the samples were collected from wells installed in the fill. Due to lost, destroyed, or inaccessible monitors, no monitors were sampled from Block NE, and only one existing monitor was sampled in each of Blocks D, E and L.

Samples also were collected from six wells that were installed in the bedrock around the perimeter of Ataratiri to determine if the quality of groundwater in the bedrock entering the area is different than that leaving the area.

All groundwater samples were analyzed for general indicator parameters such as pH and conductivity, major anions and cations, nutrients, total organic carbon, total oil and grease, and specific organic compounds including BTEX, PAHs, and PCBs. Tables 5.4 and 5.5 summarize the number of samples analyzed for each parameter as well as the average, minimum, and maximum concentration measured.

5.5.2 Overburden Groundwater Quality

The analytical results of the groundwater samples collected in 1989 are summarized in Tables 5.4a and 5.4b. All but two of the groundwater samples collected from the overburden represent the "shallow" groundwater in the overburden noted in Section 5.4.1. As reported in Chapter 4, this soil layer contains the majority of the contaminated soil at Ataratiri.

Nine of the inorganic parameters analyzed in samples of the shallow groundwater frequently exceeded the CDWQG, PWQO, or ODWQO for arsenic, cadmium, cyanide, iron, lead, mercury, nickel, selenium, and sodium. Of these nine parameters, the guidelines for iron and sodium are not based on health considerations and therefore were judged not to be cause for remediating groundwater at Ataratiri. For six of the other seven parameters, the concentrations in groundwater where it enters Ataratiri were observed to be the same as those where the groundwater leaves the site. This indicates that the only contaminant requiring remediation is cyanide.

The concentrations of the remaining seven parameters also were compared to the MENVIQ Level B value. Only cyanide and mercury were measured at non-complying concentrations.

The overall conclusion based on these two comparisons is that the Ataratiri site is not contributing to the groundwater concentrations of inorganic parameters with the exception of cyanide and that some form of remediation will be needed for cyanide. The elevated concentrations of cyanide are found in Block A were the former coal gasification plant operated.

Information about organic contaminants was first generated during the preliminary investigations undertaken in 1988 which reported evidence (in the form of floating material, odours, and visible petroleum) of organic contamination of the groundwater in several parts of Ataratiri. These included Block A, the centre of Block G, the southeast

Table 5.4a

OVERBURDEN GROUNDWATER QUALITY - INORGANIC PARAMETERS

Parameter	Sample Size	Average	Minimum	Maximum
aluminum (mg/L)	20	0.058	<0.05	0.44
arsenic (µg/L)	20	8	<1	28
barium (mg/L)	20	0.139	0.029	0.319
beryllium (mg/L)	20	<0.0005	<0.0005	<0.0005
boron (mg/L)	20	0.408	0.113	0.938
cadmium (mg/L)	20	<0.005	<0.005	<0.005
calcium (mg/L)	20	149	54.8	449
chromium (mg/L)	20	<0.01	<0.01	0.01
cobalt (mg/L)	20	<0.05	<0.05	<0.05
copper (mg/L)	20	0.01	<0.01	0.05
cyanide total (µg/L)	20	454	1	4500
iron (mg/L)	20	2.05	<0.01	17.4
lead (mg/L)	20	0.06	<0.05	0.09
magnesium (mg/L)	20	56.4	17.5	180
manganese (mg/L)	20	0.91	0.04	7.12
mercury (µg/L)	20	0.07	<0.05	0.19
molybdenum (mg/L)	20	<0.2	<0.2	<0.2
nickel (mg/L)	20	<0.05	<0.05	<0.05
phosphorus (mg/L)	20	0.695	<0.5	3.4
potassium (mg/L)	20	21.0	3.5	76
selenium (µg/L)	20	6	<1	21
silicon (mg/L)	20	8.42	4.26	12.2
silver (mg/L)	20	<0.005	<0.005	<0.005
sodium (mg/L)	20	325	26.8	2200
strontium (mg/L)	20	0.69	0.314	1.4
thorium (mg/L)	20	<0.05	<0.05	<0.05
vanadium (mg/L)	20	0.006	<0.005	0.013
zinc (mg/L)	20	0.01	<0.01	0.04
zirconium (mg/L)	20	<0.02	<0.02	0.02
oil and grease (mg/L)	41	11	1	187
pH (pH units)	41	7.51	6.65	10.32
specific conductance (µmhos/cm)	41	3769	860	56300
TKN (mg/L)	41	12.1	0.23	204
TOC (mg/L)	41	15.7	0.2	64

Note:

When calculating the averages, values less than the detection limit were assumed to be equal to detection limit.

Table 5.4b

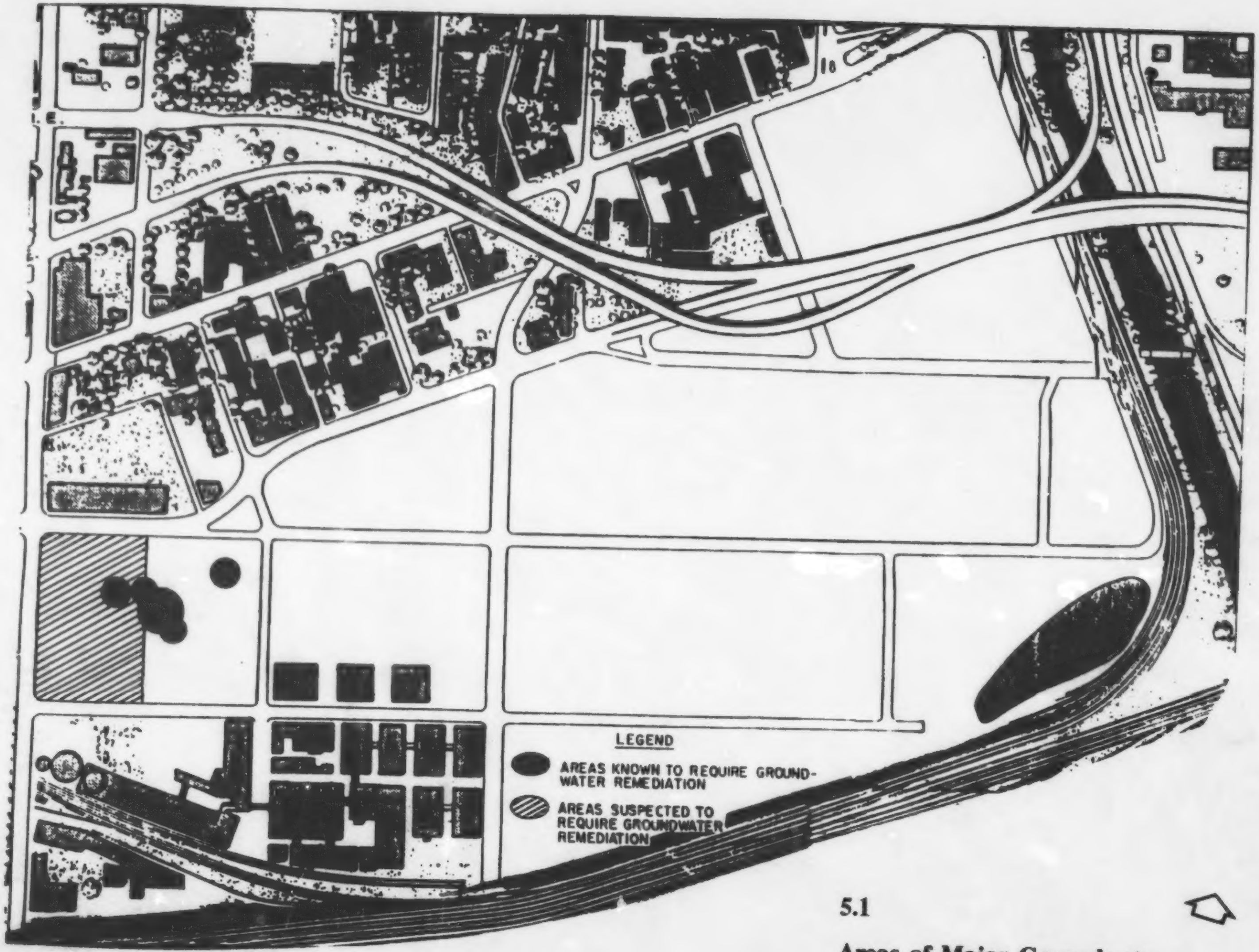
OVERBURDEN GROUNDWATER QUALITY - ORGANIC PARAMETERS

Parameter	Sample Size	Average	Minimum	aximum
acenaphthene	41	25.8	<0.5	420
acenaphthylene	41	13.3	<0.5	275
anthracene	41	36.8	<0.5	8.43
benzo[a]anthracene	41	28.2	<1.0	648
benzo[a]pyrene	41	15.3	<1.0	334
benzo[b]fluoranthene	41	13.7	<1.0	324
benzo[ghi]perylene	41	6.0	<1.0	105
benzo[k]fluoranthene	41	9.4	<1.0	197
chrysene	41	26.4	<1.0	666
dibenzo[a,h]anthrancene	41	1.0	<1.0	1.4
fluoranthene	41	64	<0.5	1360
fluorene	41	76	<0.5	1730
ideno[1,2,3-c,d]pyrene	41	5.8	<1.0	103
naphthalene	41	285	<0.5	5740
phenanthrene	41	127	<0.5	4250
pyrene	41	55.5	<0.5	1620
benzene	41	522	<0.1	8340
toluene	41	235	<0.2	5110
ethylbenzene	41	172	<0.2	2870
m-xylene and p-xylene	41	194	<0.2	3160
o-xylene	41	81.7	<0.2	1230
PCBs	7	<0.02	<0.01	<0.02

Note:

All values in μg/L.

When calculating the averages, values less than the detection limit were assumed to be equal to the detection limit.


LEGEND
AREAS KNOWN TO REQUIRE GROUND-WATER REMEDIATION
AREAS SUSPECTED TO REQUIRE GROUNDWATER REMEDIATION

5.1

Areas of Major Groundwater Contamination

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corner of Block H, the centre of Block I, Block K, the southern edge of Block M, Block NE, and Block P.

During the 1989 investigations, all of the overburden groundwater samples were analyzed for general indicators such as total organic carbon (TOC), total Kjeldahl nitrogen (TKN), and oil and grease. Elevated levels of TOC were reported across the site. Elevated values of oil and grease were reported in Blocks A and M.

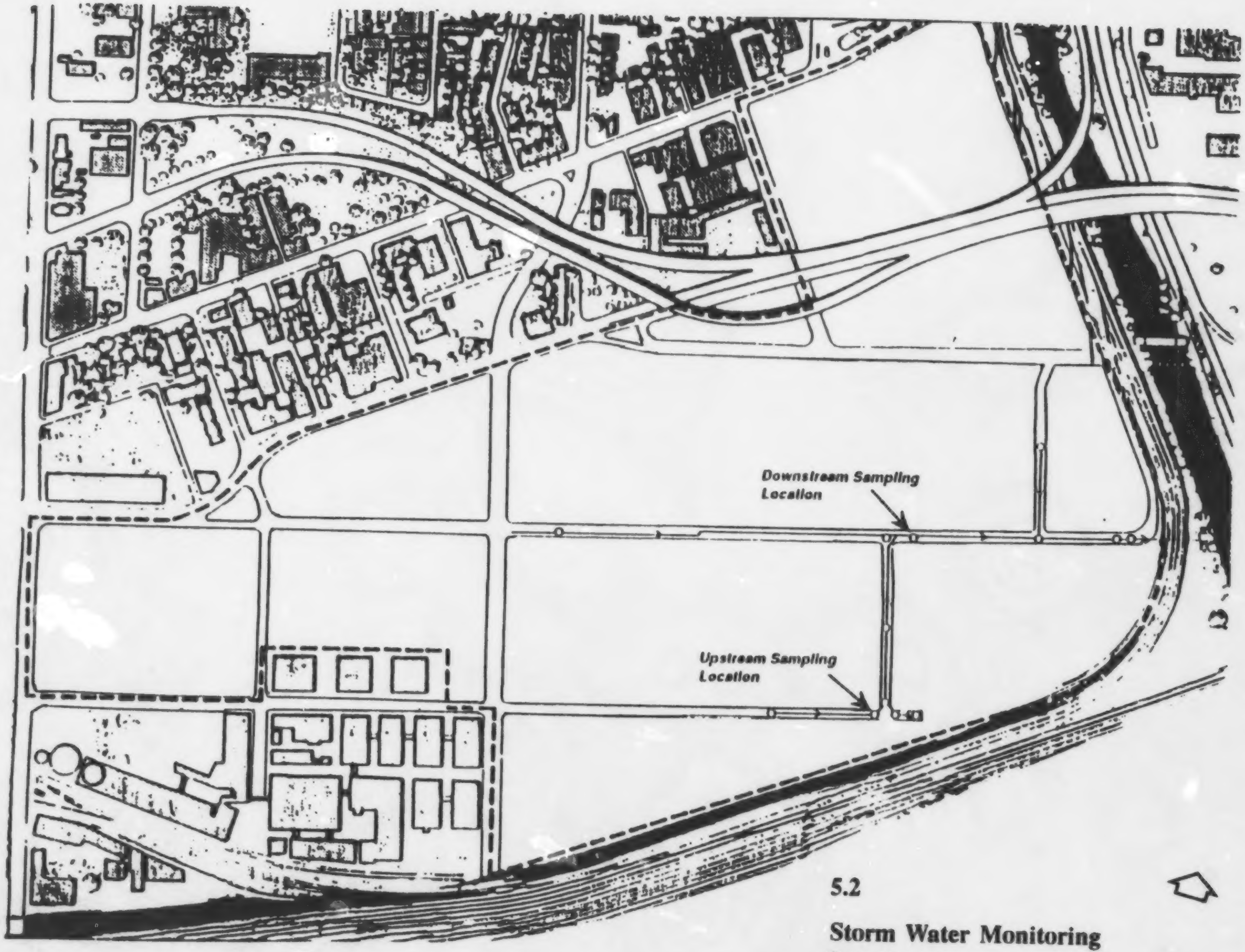
All of the overburden groundwater samples collected in 1989 were analyzed for BTEX, PAHs, and PCBs. Twelve of the samples showed the presence of one or more of the BTEX compounds and 12 showed the presence of one or more of the PAHs. Where measured, the BTEX and PAHs exceeded the MENVIQ Level B values and therefore may require remediation. The wells where organic contamination has been observed are located predominantly in Blocks A and M, and to a lesser extent in Blocks E, G, H, and K. Figure 5.1 shows the areas of Ataratiri where major groundwater remediation likely will be required. PCBs were not detected in any of the groundwater samples that were analyzed.

The poor groundwater quality observed in Block A is likely due to the historical use of the majority of the block as a coal gasification plant. The groundwater samples from Block A were taken from inside underground concrete structures that once supported large above-ground storage tanks. These support structures extend into the native soils to a depth of about 5 m below ground surface, with the exception of the large central tank structure which rests on top of the bedrock. The contamination is likely contained inside these tank structures or has migrated vertically into the bedrock, and subsequently migrated horizontally through the bedrock towards the south-southwest. Visible coal tar contamination was observed in fractures in the native clay till, supporting the theory of vertical movement of coal tar towards the bedrock. The groundwater outside the concrete structures was not tested. Coal tar contamination of groundwater in these areas is suspected to be present at a lesser degree than inside the concrete structures.

The shallow groundwater in Block M contains visible hydrocarbon contamination and odour. A film of hydrocarbon was observed floating on the groundwater in one well. The contamination observed in Blocks E, G, H and K are likely isolated occurrences as a result of local leakage from fuel storage tanks and/or at scrap yards.

All three wells on Block P had elevated levels of TOC and TKN. In addition, one well had elevated levels of iron and manganese. The presence of elevated levels of TOC and TKN, could be due to the former operations of the rendering facility at the block.

Trace amounts of PAHs and BTEX also were measured in samples from the three wells at Block P. On the basis of these results, remediation is not required; however,


Downstream Sampling Location
Upstream Sampling Location
Storm Sewer Location
Maintenance Hole
Direction Of Flow
Site Boundary

5.2

Storm Water Monitoring Locations

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remediation should still be considered for this area because groundwater contaminated hydrocarbons may be migrating into Block P from the bulk fuel storage facility formerly situated to the north.

5.5.3 Bedrock Groundwater Quality

Metals and indicator parameters (TOC, TKN and oil and grease) detected in the bedrock groundwater are generally present at the same concentrations as those detected in the overburden groundwater (see Table 5.5a and 5.5b).

Given the significant organic contamination identified within the concrete structures in Block A, there may be coal tar contamination in the bedrock beneath this block. Due to restricted access, the bedrock monitor planned for Block A was not installed. Therefore, a direct assessment of contamination in the bedrock was not possible. Drilling and testing of bedrock groundwater beneath Block A to identify the significance and extent of possible coal tar contamination will be needed to prepare the detailed soil and groundwater remediation programs for this area.

The bedrock beneath the remainder of the site is unlikely to be contaminated because upwards of 6 m of relatively contaminant free native till separates the contaminated fill layer from the bedrock. The results of the analysis of groundwater from the bedrock monitors support this conclusion.

5.6 Storm Water Quality Investigations

5.6.1 Monitoring Program

Discrete samples were collected during a storm (9.4 mm rainfall) on 27 November 1989 at the two locations shown in Figure 5.2. The downstream location at Front Street East and Overend Street was selected to represent the storm sewer discharge into the Don River. Both stations are below the water table and are near areas where groundwater is contaminated.

Seven samples were collected at each location to represent dry flow (prior to the storm) and the peak of the storm as well as at five specific times after the peak of the storm (ten minutes, one hour, two hours, five hours, and 12 hours). All of the storm water samples were analyzed for 54 parameters including pH, various elements, total organic carbon, total oil and grease, BTEX, PAHs, PCBs, and cyanide. Tables 5.6a and 5.6b summarize the analytical results.

Table 5.5a

BEDROCK GROUNDWATER QUALITY - INORGANIC PARAMETERS

Parameter	Sample Size	Average	Minimum	Maximum
aluminum (mg/L)	6	0.09	<0.05	0.28
arsenic (μg/L)	6	1	<1	2
barium (mg/L)	6	2.12	0.588	4.28
beryllium (mg/L)	6	<0.0005	<0.0005	<0.0005
boron (mg/L)	6	1.68	0.952	2.42
cadmium (mg/L)	6	<0.005	<0.005	<0.005
calcium (mg/L)	6	194	63.2	436
chromium (mg/L)	6	<0.01	<0.01	<0.01
cobalt (mg/L)	6	<0.05	<0.05	<0.05
copper (mg/L)	6	<0.01	<0.01	0.01
cyanide total (μg/L)	6	5	3	8
iron (mg/L)	6	0.17	0.03	0.51
lead (mg/L)	6	<0.05	<0.05	<0.05
magnesium (mg/L)	6	68	30.1	147
manganese (mg/L)	6	0	0.11	0.61
mercury (μg/L)	6	0.08	<0.05	0.16
molybdenum (mg/L)	6	<0.2	<0.2	<0.2
nickel (mg/L)	6	<0.05	<0.05	<0.05
phosphorus (mg/L)	6	<0.5	<0.5	<0.5
potassium (mg/L)	6	28	14.7	47.8
selenium (μg/L)	6	<1	<1	<1
silicon (mg/L)	6	4.49	4.06	5.44
silver (mg/L)	6	<0.005	<0.005	<0.005
sodium (mg/L)	6	569	186	1410
strontium (mg/L)	6	9	2.9	22.9
thorium (mg/L)	6	<0.05	<0.05	<0.05
titanium (mg/L)	6	<0.005	<0.005	<0.005
vanadium (mg/L)	6	<0.005	<0.005	<0.005
zinc (mg/L)	6	<0.01	<0.01	<0.01
zirconium (mg/L)	6	<0.02	<0.02	<0.02
oil and grease (mg/L)	6	6	3	8
pH (pH Units)	6	7.4	7.18	7.55
specific conductance (μmhos/cm)	6	4062	2030	8070
TKN (mg/L)	6	3.3	0.38	8.40
TOC (mg/L)	6	6.3	2.20	12.1

Note:
When calculating the averages, values less than the detection limit were assumed to be equal to detection limit.

Table 5.5b

BEDROCK GROUNDWATER QUALITY - ORGANIC PARAMETERS

Parameter	Sample Size	Average	Minimum	Maximum
acenaphthene	6	<0.5	<0.5	<0.5
acenaphthylene	6	<0.5	<0.5	<0.5
anthracene	6	<0.5	<0.5	<0.5
benzo[a]anthracene	6	<1.0	<1.0	<1.0
benzo[a]pyrene	6	<1.0	<1.0	<1.0
benzo[b]fluoranthene	6	<1.0	<1.0	<1.0
benzo[ghi]perylene	6	<1.0	<1.0	<1.0
benzo[k]fluoranthene	6	<1.0	<1.0	<1.0
chrysene	6	<1.0	<1.0	<1.0
dibenzo[a,h]anthrancene	6	<1.0	<1.0	<1.0
fluoranthene	6	<0.5	<0.5	<0.5
fluorene	6	<0.5	<0.5	<0.5
ideno[1,2,3-c,d]pyrene	6	<1.0	<1.0	<1.0
naphthalene	6	<0.5	<0.5	<0.5
phenanthrene	6	<0.5	<0.5	<0.5
pyrene	6	<0.5	<0.5	<0.5
benzene	6	<1.0	<1.0	<1.0
toluene	6	0.3	<0.2	0.6
ethylbenzene	6	<0.2	<0.2	<0.2
m-xylene and p-xylene	6	0.2	<0.2	0.2
o-xylene	6	<0.2	<0.2	<0.2
PCBs	6	<0.01	<0.01	<0.01

Note:

All values in μg/L.

Table 5.6a

STORM WATER QUALITY - INORGANIC PARAMETERS

Parameter	Sample Size	Average	Minimum	Maximum
aluminum	14	<0.43	<0.43	4.39
antimony (μg/L)	14	<1	<1	1
arsenic (μg/L)	14	<1.36	<1	2
beryllium	14	<0.0005	<0.0005	<0.0005
cadmium	14	<0.0052	<0.005	0.008
chromium	14	<0.01	<0.01	<0.01
cobalt	14	<0.05	<0.05	<0.05
copper	14	<0.014	<0.01	0.04
cyanide free (μg/L)	14	<1	<1	1
iron	14	0.75	0.03	5.20
lead	14	<0.05	<0.05	<0.05
manganese	14	1.07	0.14	3.68
mercury (μg/L)	14	<0.068	<0.05	0.15
molybdenum	14	<0.2	<0.2	<0.2
nickel	14	<0.05	<0.05	<0.05
pH	14	7.84	7.61	8.37
phosphorus	14	<0.54	<0.5	0.8
silver	14	<0.005	<0.005	<0.005
tin	14	<0.1	<0.1	0.1
titanium	14	<0.0095	<0.005	0.057
vanadium	14	<0.0058	<0.005	0.010
zinc	14	0.12	0.02	0.29
oil and grease	14	3.6	<1	10
TOC	14	7.96	3.7	14.8

Note:

When calculating the averages, values less than the detection limit were assumed to be equal to detection limit.

Table 5.6b

STORM WATER QUALITY - ORGANIC PARAMETERS

Parameter	Sample Size	Average	Minimum	Maximum
acenaphthene	41	<0.49	0.4	0.5
acenaphthylene	41	<0.5	<0.5	0.5
anthracene	41	<0.5	<0.5	<0.5
benzo[a]anthracene	41	<1.0	<1.0	<1.0
benzo[a]pyrene	41	<1.0	<1.0	<1.0
benzo[b]fluoranthene	14	<1.0	<1.0	<1.0
benzo[ghi]perylene	14	<1.0	<1.0	<1.0
benzo[k]fluoranthene	14	<1.0	<1.0	<1.0
chrysene	14	<1.0	<1.0	<1.0
dibenzo[a,h]anthrancene	14	<1.0	<1.0	<1.0
fluoranthene	14	<0.5	<0.5	<0.5
fluorene	14	<0.49	0.4	0.5
indeno[1,2,3-c,d]pyrene	14	<1.0	<1.0	<1.0
naphthalene	14	0.62	0.5	1.2
phenanthrene	14	<0.49	0.4	0.5
pyrene	14	<0.5	0.5	0.5
benzene	14	0.30	<0.1	2.5
toluene	14	0.31	<0.2	1.7
ethylbenzene	14	0.21	<0.2	0.4
m-xylene and p-xylene	14	1.03	<0.2	10.5
o-xylene	14	0.69	<0.2	6.3
PCBs	14	<0.025	<0.02	0.009

Notes:

As values in μg/L.

When calculating the averages, values less than the detection limit were assumed to be equal to the detection limit.

5.6.2 Storm Water Quality

One of the storm water samples clearly exceeds the Metro Sewer By-Law guidelines for cadmium and PCBs, three samples exceed the guideline for copper, and 11 samples exceed the guideline for zinc. Similar, non-complying concentrations of zinc would be measured in storm water elsewhere in Toronto. The three non-complying copper data are only marginally above the guideline and do not indicate the presence of a major source of copper contamination.

As shown in Table 5.6b, the storm water samples were analyzed for specific organic compounds including several PAHs and BTEX compounds. Only a few of the samples contained concentrations above the detection limits and those results appear to be randomly distributed among the samples. All of the concentrations of PAHs and BTEX are below the MENVIQ Level B values.

Overall, the quality of the water in the section of storm sewer that was monitored complies with most of the guidelines and the non-complying results do not appear to warrant immediate remedial action. Nevertheless, storm water management facilities will be part of the Ataratiri infrastructure (see Section 5.6.3).

The data gathered during the storm event was also used to evaluate the extent of groundwater infiltration into the storm sewer, and changes to storm water quality during the course of the event.

The extent of groundwater infiltration into the storm sewer can be assessed by comparing the quality measured at the upstream station to that at the downstream station. For this study, the evaluation is limited in that only seven samples were collected from each station and general trends often are not evident in a small data set. For these two stations, the most apparent trends are that concentrations of manganese and iron decreased as the water in the storm sewer flowed from the upstream station to the downstream station. At the same time, concentrations of aluminum and zinc increased. Based on a comparison of the median and average concentrations measured at the upstream station, the downstream station, and the local groundwater in the overburden, there is no indication that these four changes in storm sewer water quality are the result of groundwater infiltrating into the sewer. Therefore, it is concluded that infiltration is not occurring in this reach of storm sewer.

Whether the quality of the storm water changed during the course of the storm is not clearly demonstrated by the data that was generated. Relative to the concentrations measured before the peak flow, concentrations after the peak suggest increases in total organic carbon and specific BTEX compounds at both stations. The increases are relatively small and could be the result of storm runoff from streets and parking areas.

5.6.3 Proposed Storm Water Management Facilities

Redevelopment of the Ataratiri site will provide opportunities to alter storm water drainage and to management storm runoff. The site is currently bisected by a sewer which runs down Cherry Street and discharges into the Keating Channel without any treatment. It is proposed to install new storm water sewers and to direct storm water to a buried tank that would be located south of Mill Street and east of Cherry Street. The sediment carried by the storm water will settle in the tank. The sediment would be pumped out to the sanitary sewer system twice a year (Marshall Macklin Monaghan, 1991a). Both the MOE and the Metro Toronto and Region Conservation Authority have indicated approval in principle to the proposed facilities.

5.7 Human Health Aspects Associated with Groundwater and Storm Water Quality

5.7.1 Current Limitations

Because groundwater clean-up guidelines have not yet been confirmed and the remediation options to be used have not been finalized, potential health risks to future residents of Ataratiri or site neighbours have not been estimated or assessed in detail. The *Health Risks Issue Study of the Air, Soil and Groundwater Quality at the Ataratiri Site* identifies several groundwater or storm water exposure pathways by which future site users or neighbours could come into contact with contaminants (CanTox, 1991a).

Soils with the highest concentrations of contaminants will be removed, treated, contained, or otherwise managed. As a result, the potential for contaminants to move in groundwater and storm water will be substantially reduced, however, these potential exposure pathways still need to be evaluated.

5.7.2 Concerns for Future Site Users

Water-related exposure pathways usually include direct ingestion, irrigation of plants, or livestock watering; however, for Ataratiri none of these pathways are likely to occur since groundwater flow is limited and municipal water supplies are readily available.

One of the soil remediation options discussed in Chapter 4 could leave some soils that contain contaminants in excess of the clean-up guidelines beneath the surface at Ataratiri. Other options involve mobilizing contaminants which could inadvertently not be collected. If either of these types of options was to be used, a concern of both future site users and neighbours would be the possible migration of contaminants via groundwater to the Don River and/or Lake Ontario. Before such options could be used at Ataratiri, both the possible health risks and potential environmental effects would need to be evaluated. Although the quantities of chemicals involved may be small and dilution would occur en route to the Don River or Lake Ontario, in theory, the chemicals could affect aquatic life and enter aquatic food chains, and result in potential human exposures from the consumption of fish taken from these waters.

5.7.3 Concerns for Workers During Remediation

Just as remediation workers have the potential to come into contact with contaminants in soil, so too can they come into contact with groundwater contaminants. Potential exposure pathways include the inhalation of vapours and dermal contact with water that contains contaminants. These pathways can be greatly reduced or eliminated by wearing protective clothing and following appropriate procedures. The types of health and safety programs noted in Section 4.6.3 should take these exposure pathways into account.

5.7.4 Concerns for Neighbours

The potential exposure pathways for neighbours during remediation activities include the inhalation of vapours that originate from ground water, dermal contact with storm water if runoff is not controlled at the work site, and dermal contact if groundwater is being transported off-site and an accident occurs.

The possible inhalation of vapours is unlikely to be substantial but should be evaluated in the same manner as the inhalation of vapours that originate from soils. Such exposures would need to be estimated for any situation with the potential to generate vapours.

As noted in Section 4.6.4, movement of contaminants via storm water runoff during remediation activities would only be possible if contaminated material was stored in such a way that it could come into contact with runoff. This can be avoided by incorporating proper precautions into site management activities.

Exposure by dermal contact following a transportation accident would need to be evaluated only for remediation options that involve off-site disposal or treatment.

5.8 Remedial Options and Strategies for Groundwater

5.8.1 Identifying Potential Options

Just as there are many types of options for managing contaminated soils, there are also numerous options for managing groundwater. The options can be grouped into three general categories: those that involve off-site disposal, those that treat contaminants either by destroying them or separating them from the water, and those that manage contaminated groundwater on-site.

Published information has been assembled for 18 potential (see Table 5.7) options and the same two-phase approach used to evaluate soil remediation options (see Section 4.7.1) has been used to identify those most suitable for use at Ataratiri. The options listed in Table 5.8 have been judged to be suitable and, therefore, pass to Phase II for further evaluation.

The objective of Phase II is to evaluate each option according to whether it eliminates, reduces, or increases the potential for future site users or neighbours to be exposed to groundwater or storm water contamination, and whether the option eliminates, reduces, or increases the ability of any residual contamination to move around in the environment.

Because Ataratiri-specific information is not yet available for Phase II, it is premature to eliminate any of the options that passed Phase I. It is expected that bench scale and/or pilot scale tests will be undertaken for some of the options that have passed Phase I. The results of those tests will provide site-specific information that can be used for Phase II. Accordingly, all options that have passed Phase I (as well as any new options that pass Phase I at a later date) are possible candidates for bench scale or pilot scale testing. In preparing detailed remediation plans, it is anticipated that health risks will be assessed to improve Phase II evaluations.

5.8.2 The Preferred Groundwater Management Strategy

On the basis of the contaminants of concern, the estimated volumes of water that will need to be addressed, the characteristics and capabilities of the options that passed Phase I, and regulatory requirements, an overall groundwater management strategy has been prepared for Ataratiri.

The strategy addresses conditions at the specific blocks where remediation is required (Blocks A, M, and P) and two types of conditions that may occur at any part of Ataratiri (dewatering activities at excavations and localized areas of contamination).

Block A contains some of the most contaminated groundwater at Ataratiri. The contamination also includes dense non-aqueous phase liquid (DNAPL) present at great depths and will be extremely difficult to remove. There is an estimated 12,600 m^3 of contaminated groundwater present within the concrete foundations of the coal gasification plant at the site.

Treatment options could include either *ex situ* or *in situ* bioremediation of the more heavily contaminated groundwater. Bench scale and/or pilot scale tests would be needed to confirm the effectiveness of either option. Costs of on-site treatment are estimated to

Table 5.7

GROUNDWATER REMEDIATION OPTIONS EXAMINED FOR ATARATIRI

untreated off-site disposal

- contaminated groundwater is extracted and disposed as a non-hazardous or hazardous liquid industrial waste at an appropriate disposal facility; groundwater owner must become waste generator and follow proper transportation procedures; only recommended for situations where excavation is required, the extent of contamination is limited, and other factors preclude on-site treatment methods
- disposal facilities will accept soils with inorganic and organic contaminants
- by-products, such as dust and/or vapours resulting from excavation of the soil, may be associated with this option

bioremediation

- uses microorganisms to enhance the natural breakdown of organic contaminants by mineralization to inorganics such as carbon dioxide and water; two techniques: biostimulation which involves stimulating the micro-organisms that already exist in the soil, and bioaugmentation which involves culturing the micro-organisms in a laboratory and introducing them to the site
- suitable for organic contaminants only; can not treat metal contamination
- by-products include inorganic substances such as carbon dioxide; if excavation is required, dust and/or vapours may result

free product recovery

- involves the recovery of pure organic compounds which are floating on or have sunk beneath the water table for disposal or recycling
- suitable for organic contaminants
- if excavation is required, by-products such as dust and/or vapours may result

air stripping

- contaminated water is brought into contact with air so that the volatile organic compounds in the water undergo a phase change from liquid to vapour;
- effective for removing volatile organic carbons if groundwater is low in suspended solids
- by-products include vapours; since volatile organics are transferred directly to the atmosphere, air emission controls are generally required

Table 5.7 (continued)

carbon adsorption

- groundwater is passed through an activated carbon filter to which organic compounds will adsorb; pretreatment of the groundwater may be necessary
- effective for removing most dissolved organic compounds, especially those with relatively low solubilities
- by-products include used carbon filters that require regeneration or disposal; carbon owner must become a waste generator and follow proper transportation procedures

microencapsulation

- involves immobilizing organic contaminants by using polymers or other solid media to entrap them; end product may be granular or monolithic
- not effective for inorganic contaminants
- by-products, such as vapours, may be associated with this option

chemical oxidation

- groundwater is extracted and passed through a reaction chamber where the organic contaminants are oxidized by agents such as chlorine, hydrogen peroxide, or ozone
- permanently destroys organic compounds
- by-product composition will depend on the type of oxidizing agent used; for example, if chlorine is used, by-products may include chlorinated hydrocarbons

dechlorination

- destroys PCBs by stripping chlorine atoms from the molecule by using sodium to form salt and hydrocarbon residues; hydrocarbon residues produced may require subsequent treatment or disposal; fire protection may also be necessary
- designed to remove PCBs
- by-products include salt and hydrocarbon residues

chemical addition

- chemicals are added to contaminated water to adjust pH, precipitate solids or metals and separate oil/water emulsions; treated water generally has a high pH which may require subsequent treatment
- suitable for inorganics and organics
- by-products include metal-laden sludge; owner of sludge must become a waste generator and follow proper transportation procedures

physical separation

- removes suspended solids from groundwater using filtration or settling techniques
- not effective for the removal of dissolved inorganic contaminants
- by-products include the contaminant-laden filter cake

Table 5.7 (continued)

ion exchange

- ions of one type are displaced from an insoluble exchange material in an ion exchange column by ions of a different type in the water; separate units are required for removing anions and cations
- effective in removing dissolved heavy metals; not effective on organic compounds or suspended solids
- by-products include the used exchange material which must be regenerated periodically

reverse osmosis

- dissolved salts are removed from groundwater by filtering water through a semi-permeable membrane at a high pressure; pretreatment of the groundwater is usually necessary
- effective for removing dissolved organics and some dissolved organics
- by-products include the used membrane which must be replaced or regenerated periodically

electrodialysis

- electrical current is passed through the groundwater between two electrodes: cations in solution migrate through a semi-permeable membrane towards the negative electrode; and anions pass through another membrane toward the positive electrode; to reduce fouling of the membrane, pretreatment is recommended
- not effective in removing organic compounds or suspended solids
- by-products may include precipitated low solubility salts

distillation

- involves boiling the groundwater, collecting the steam, and condensing it; because volatile organics will evaporate and condense with the water, the condensate requires secondary treatment
- suitable for volatile organics; does not remove dissolved inorganic solids
- by-products include the boiled groundwater containing high concentration of dissolved inorganic solids

on-site management

- the contaminated groundwater is isolated using an engineered system such as an asphalt or concrete cap, or containment with vertical slurry walls; generally, a combination of isolation techniques must be employed
- suitable for groundwater contaminated with inorganics and organics; however, the long-term stability of engineered barriers against some contaminants is unproven
- by-products, such as dust and/or vapours, may result

Table 5.8

OPTIONS RECOMMENDED FOR FURTHER STUDY

Options for Managing Organic Contaminants Only

air stripping
bioremediation (*in situ* and *ex situ*)
carbon adsorption
free product recovery

Options for Managing Inorganic Contaminants Only

chemical addition

Options for Managing Organic and Inorganic Contaminants

off-site disposal
on-site management
physical separation
chemical oxidation
permeable barriers

be in the range of $0.02 to $0.10 per litre. Alternatively, off-site disposal costs are estimated to be in the range of $0.39 to $0.75 per litre.

Carbon adsorption units could be used to treat the estimated 8,500 m^3 of less contaminated groundwater outside the existing foundations. Again, bench scale and/or pilot scale tests would be needed to confirm the effectiveness of the option. Costs are estimated to be in the range of $0.02 to $0.05 per litre. To extend the treatment life of the carbon adsorption units, physical separation could be used to remove floating hydrocarbons and suspended solids.

Before treatment begins, slurry walls should be installed around the perimeter of Block A to prevent groundwater from entering the area. The cost of the wall is estimated to be approximately $150,000.

At **Block M**, there is evidence of hydrocarbon floating on the groundwater table (also referred to as "free product"). This could be removed by installing recovery pumps in wells or trenches. Alternatively the floating hydrocarbon and groundwater could be pumped into storage tanks and allowed to separate.

Depending on its chemical characteristics, the recovered hydrocarbon might be taken to a recycling facility. If unsuitable for recycling, the hydrocarbon will need to be disposed off-site as a liquid waste. An estimated 200 m^3 of floating hydrocarbon is present at Block M. Off-site disposal costs are estimated to be in the range of $0.16 to $0.39 per litre.

In addition to the free product, it is estimated that there is approximately 70,000 m^3 of contaminated groundwater at Block M that will need to be treated. Possible treatment options include carbon adsorption, air stripping, and *in situ* bioremediation. The cost of treating the groundwater is estimated to be in the range of $0.02 to $0.10 per litre.

Before treatment begins, slurry walls should be installed around the area where free product is present to minimize mixing with the surrounding groundwater. The cost to construct the wall is estimated to be approximately $1,000,000.

The groundwater at **Block P** appears to be contaminated by hydrocarbon moving onto the site and by on-site activities. Prior to treating the groundwater, it would be preferable to remove the off-site source. If that is not possible, a slurry wall barrier could be constructed to stop contamination moving on to the site; however, such a wall would not stop the contamination from moving elsewhere. The cost to construct the slurry wall is estimated to be approximately $200,000.

As at Block M, the groundwater at Block P can either be treated or disposed off-site. There is an estimated 13,000 m^3 of contaminated groundwater present at Block P. The cost of treating the groundwater is estimated to be in the range of $0.02 to $0.20 per litre while off-site disposal costs are estimated to be in the range of $0.16 to $0.75 per litre.

Site dewatering activities will be a normal part of excavation. The results of the testing to date indicate that much of the groundwater at Ataratiri can be discharged to the sanitary sewer system once suspended solids have been removed. The cost of treating the groundwater is estimated to be in the range of $0.01 to $0.05 per litre and the cost of disposing the groundwater to the sanitary sewer system is $0.27 per m^3. Costs would increase if organic contamination is found and a second treatment method (such as carbon filtration) becomes necessary. Periodic analysis of the groundwater being treated and/or discharged will be required to monitor for compliance with the Toronto Sewer Use By-Law.

Localized areas of groundwater contamination can be expected in areas such as scrap metal yards and around storage tanks that have leaked. It is anticipated that the same options used at Blocks A, M, and P will be used but it will be necessary to characterize each area before the actual options can be selected. Unit costs to treat this groundwater are estimated to be in the range of $0.02 to $0.10 per litre.

Unlike the precedent-setting nature of the preferred soil management strategy (described in Section 4.7.2), the preferred groundwater management strategy outlined above largely relies on remediation options that have been used elsewhere. This does not eliminate the need to demonstrate the effectiveness of some options for Ataratiri using bench scale and/or pilot scale studies.

Like soil management, various aspects of groundwater management have been the subjects of on-going discussions between City staff and MOE staff. These discussions will continue until all of the components of the groundwater management are in place and have the endorsement of all the affected parties.

5.8.3 Finalizing the Management Plan

Decisions about which option or combination of options will be used at Ataratiri will be made as each area of the site is scheduled for remediation. Many of the factors that will need to be considered to finalize soil management plans for specific areas of the site also will need to be considered to finalize groundwater management programs. These factors can be addressed by investigating areas previously not sampled, conducting bench scale and/or pilot scale tests of promising options, and assessing potential health risks.

With the information from such studies, it will be possible to improve the assessments of options and more clearly identify those options that should be used at Ataratiri. It is expected that similar information requirements to those outlined in Section 4.7.3 will be required to receive approval to use groundwater remediation options. It also is expected that soil and groundwater remediation activities will be combined to some extent at many parts of Ataratiri. Some options, such as bioremediation, can address contaminants in soil and groundwater simultaneously.

Once detailed soil and groundwater remediation plans have been approved by appropriate regulatory agencies, groundwater management activities can begin.

5.8.4 Groundwater Management Priorities

The sequence in which blocks or parcels at Ataratiri will be redeveloped is not known; however, enough is known about conditions in Blocks A, M and P to recommend that remediation should be implemented in these blocks at a relatively early stage to minimize the movement of groundwater and the dispersion of contaminants in the general area (and to the Don River in the case of Blocks M and P).

5.9 Recommendations for Further Studies

Further work is needed before groundwater and storm water management plans can be finalized. These efforts include further sampling of groundwater quality in areas previously inaccessible, bench scale and/or pilot scale testing of some options, and assessing the potential health risks associated with some options. Specific recommendations include:

- Additional sampling is required to improve the definition of contaminated groundwater in several areas of the site. Once properties have been vacated and/or demolished, conditions beneath the buildings can be investigated. Some parts of the site have not been sampled due to restricted access. The largest gaps in information concern several scrap metal yards and service stations still operating when past monitoring efforts were undertaken, parts of Block A, and beneath existing buildings.

- Drilling and testing of bedrock groundwater beneath Block A is recommended as part of the preparation of detailed soil and groundwater remediation programs for this area of the site, to identify the significance and extent of possible coal tar contamination.

- Bench and/or pilot scale tests are needed to confirm the effectiveness for some options. These tests also assist in confirming if clean-up guidelines can be achieved, estimating costs, and designing the treatment equipment.

- It is recommended that a health risk assessment be conducted for the redeveloped

Ataratiri site once all of the groundwater clean-up guidelines and land uses have been approved and a groundwater management plan has been developed. The risk assessment will assist in determining the acceptability of contaminant concentrations that will remain. The assessment also should address the exposure pathways that would exist following redevelopment.

- The health and safety programs that will need to be developed in conjunction with the MOL (see Section 4.7.3) should take into account potential exposure pathways associated with handling or treating groundwater and collected storm water.

- During building demolition, care must be taken to prevent contamination of groundwater. Environmental concerns generally associated with demolition include the presence of residual, liquid wastes present in drums, tanks or pits. Specifications are being established for demolition contractors that require the proper handling and disposal of these wastes and comply with MOE requirements.

- Procedures will need to be established for managing, treating, and/or disposing of groundwater contaminated by leaking storage tanks. This will be done in consultation with relevant agencies such as the Fuels Safety Branch of the MCCR and the MOE.

6.0 FLOOD RISK

6.1 Overview

Studies carried out for Ataratiri have identified the full extent of the lower Don flood plain for the first time (see Figure 6.1). Virtually the entire Ataratiri site lies within it. Development within flood plains is regulated by the Metropolitan Toronto and Region Conservation Authority (MTRCA). Under provincial flood plain policy, for development to proceed at Ataratiri, a Special Policy Area (SPA) designation is required. As described in Chapter 1, approval-in-principle for Ataratiri to receive an SPA designation was granted, subject to certain conditions, in December 1989 by the Ministry of Municipal Affairs.

In response to the need to consider various aspects of flood risk at Ataratiri, the City retained Marshall Macklin Monaghan Limited to undertake the following tasks:

- evaluate existing flood risks;
- identify flood risk control measures and strategies and estimate the effectiveness of each measure; and
- develop a preferred plan for flood risk management at Ataratiri.

This chapter summarizes the results of the Marshall Macklin Monaghan Limited report (1991b). It describes the guidelines and policies used to control flood risks in Ontario, evaluates the flood risks that currently exist in the lower Don flood plain, evaluates several possible control measures, outlines the preferred flood management plan, describes the residual risks and environmental impacts associated with the preferred plan, and recommends further studies that will be needed.

The preferred plan has evolved from discussions with members of the Ataratiri SPA Technical Committee which includes representatives from the City, Metropolitan Toronto, MTRCA, the Ministry of Municipal Affairs (MMA), and the MOE.

6.2 Relevant Regulations, Standards and Criteria

6.2.1 Provincial

In the interest of public safety and to protect property from flood damage, development within flood prone areas of Ontario is controlled by the policies of various government agencies. Primary amongst these agencies is the local Conservation Authority. In the Toronto area, the agency is the MTRCA. Through its Fill Regulations under the Conservation Authorities Act, and, its review powers under the Planning Act, the MTRCA attempts to prevent development within flood plains. Where development already exists within flood-susceptible areas or where redevelopment and in-fill is proposed (as in the case of Ataratiri), the MTRCA seeks to ensure that flood protection measures are carried out to acceptable criteria. The Ministry of Natural Resources (MNR), as the agency responsible for provincial flood plain policy, and the MMA, as the agency responsible for land use planning in Ontario, have final authority for setting acceptable criteria for redevelopment of such areas.

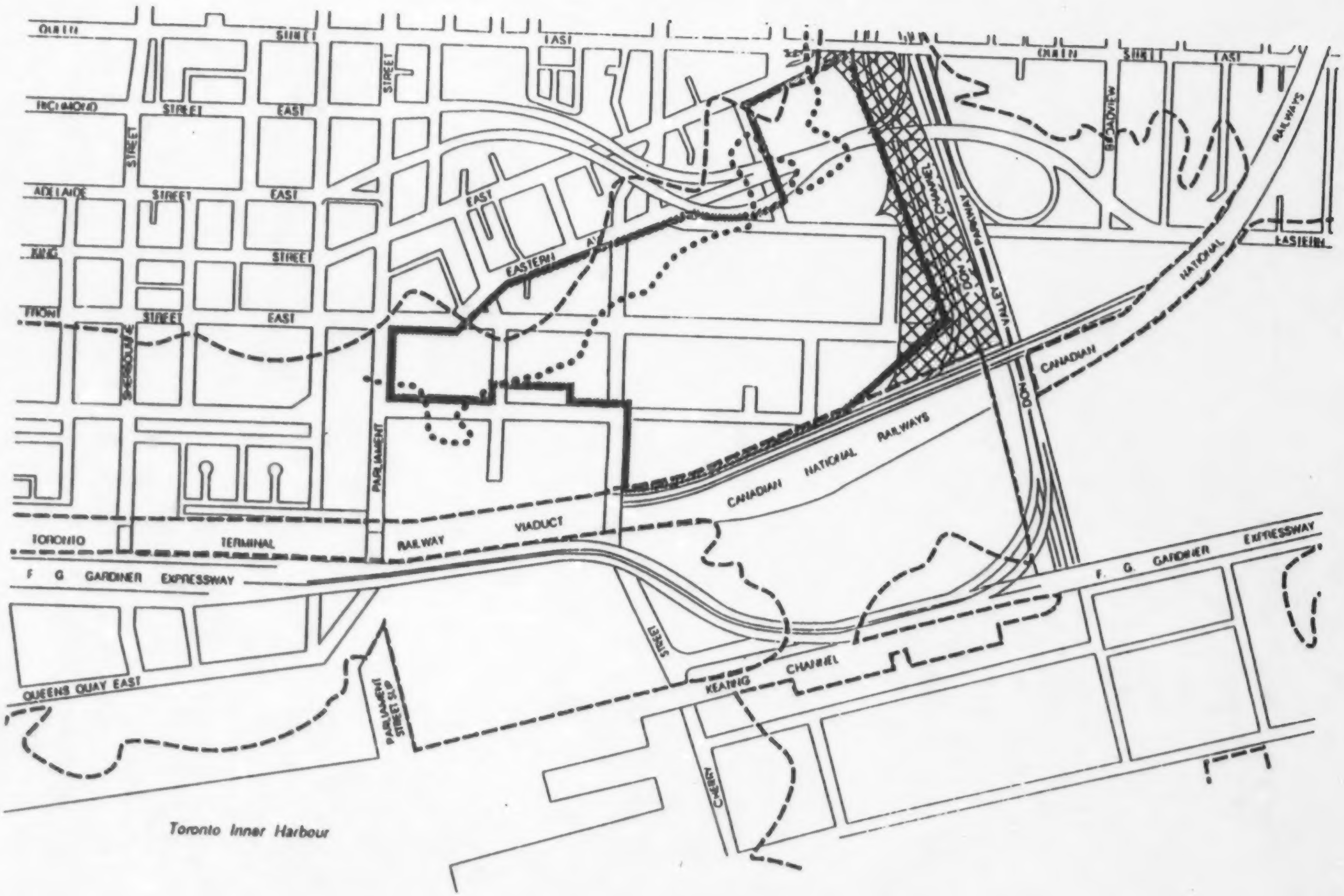
Since Hurricane Hazel in 1954, there has been a recognition in Ontario that development should not take place on flood plain lands. Public ownership and the prevention of development of such lands have been encouraged. Where development already exists within a flood plain, and, a community would be adversely affected economically or socially by the prevention of infilling or redevelopment, the need for exceptions has also been recognized. The recent *Policy Statement on Flood Plain Planning* (MNR and MMA, 1988) describes the SPA concept intended to answer the needs of such areas.

Municipalities may apply for SPA status, and controlled development may be permitted once such status is obtained. When municipalities describe SPAs in official plans, they also must include policies that indicate the circumstances under which new development may be permitted and identify the minimum acceptable level of protection required for new development. The Policy Statement also requires that any new development permitted in a flood plain must be protected by acceptable floodproofing actions or measures and that entrances and exits for buildings be such that vehicular traffic and pedestrian movement is not prevented during times of flooding.

The "Implementation Guidelines" that accompany the Policy Statement indicate that under an SPA designation, additional flexibility in setting flood protection criteria is possible. Flood protection or floodproofing to the Regulatory Flood standard (i.e. the flood that occurs when there is a Regional Storm) is not an absolute requirement. Where Regional Storm protection is not feasible, protection to a lower level (such as the 1-in-350 year flood) may be permitted. MTRCA policy requires protection to at least the level of the 1-in-350 year flood. (In any given year, a 1-in-350 year flood has a 0.3% chance of occurring.)

In 1989, it was agreed among the City of Toronto, MTRCA, MNR, and MMA that Ataratiri warranted consideration as part of an SPA designation. It was also agreed that Regional, 1-in-350 year, and 1-in-150 year flood levels of protection would be investigated for Ataratiri. Figure 6.1 illustrates the extent of the 350 year flood level for current conditions at Ataratiri and other parts of the lower Don flood plain.

The Implementation Guidelines give criteria for maximum depths and flow velocities of flood water which place limitations on the possible flood protection measures for Ataratiri.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KING STREET EAST
FRONT STREET EAST
SHERBOURNE STREET
PARLIAMENT
EASTERN AV
BROADVIEW
EASTERN
DON VALLEY PARKWAY
DON CHANNEL
CANADIAN NATIONAL RAILWAYS
TORONTO TERMINAL RAILWAY VIADUCT
F G GARDINER EXPRESSWAY
QUEENS QUAY EAST
PARLIAMENT STREET SLIP
CHERRY STREET
KEATING CHANNEL
Toronto Inner Harbour
•••• Extent of 350 Year Flood Under Existing Conditions
– – – Extent of Regulatory Flood Under Existing Conditions
▨ Floodway with Remedial Works in Place
━ Ataratiri Boundary

6.1

Proposed SPA Designation

ATARATIRI
Environmental Evaluation Study Report
September 1991

Another important aspect of the Implementation Guidelines is the role of dykes as flood protection. For a properly engineered and maintained dyke, the area on the river side of the dyke is considered to be the "floodway", while the area on the flood plain side is considered to be the "flood fringe". This implies that development may take place in the latter area but that it must be floodproofed to the Regulatory Flood level. In the case of an SPA, the level to which floodproofing is required may be lower.

6.2.2 Municipal

Local storm water drainage is an important consideration in evaluating flood protection options. Different approaches may affect local drainage in different ways. For example, a dyke system may require flap valves to prevent backflow from the river during flood periods which may temporarily cut off the outlet for local drainage. Currently, the City of Toronto uses a 2-year design criterion for storm drainage systems. For new developments such as Ataratiri, a 5-year design criterion is used. Section 5.6.3 describes major storm water management facilities being proposed for Ataratiri.

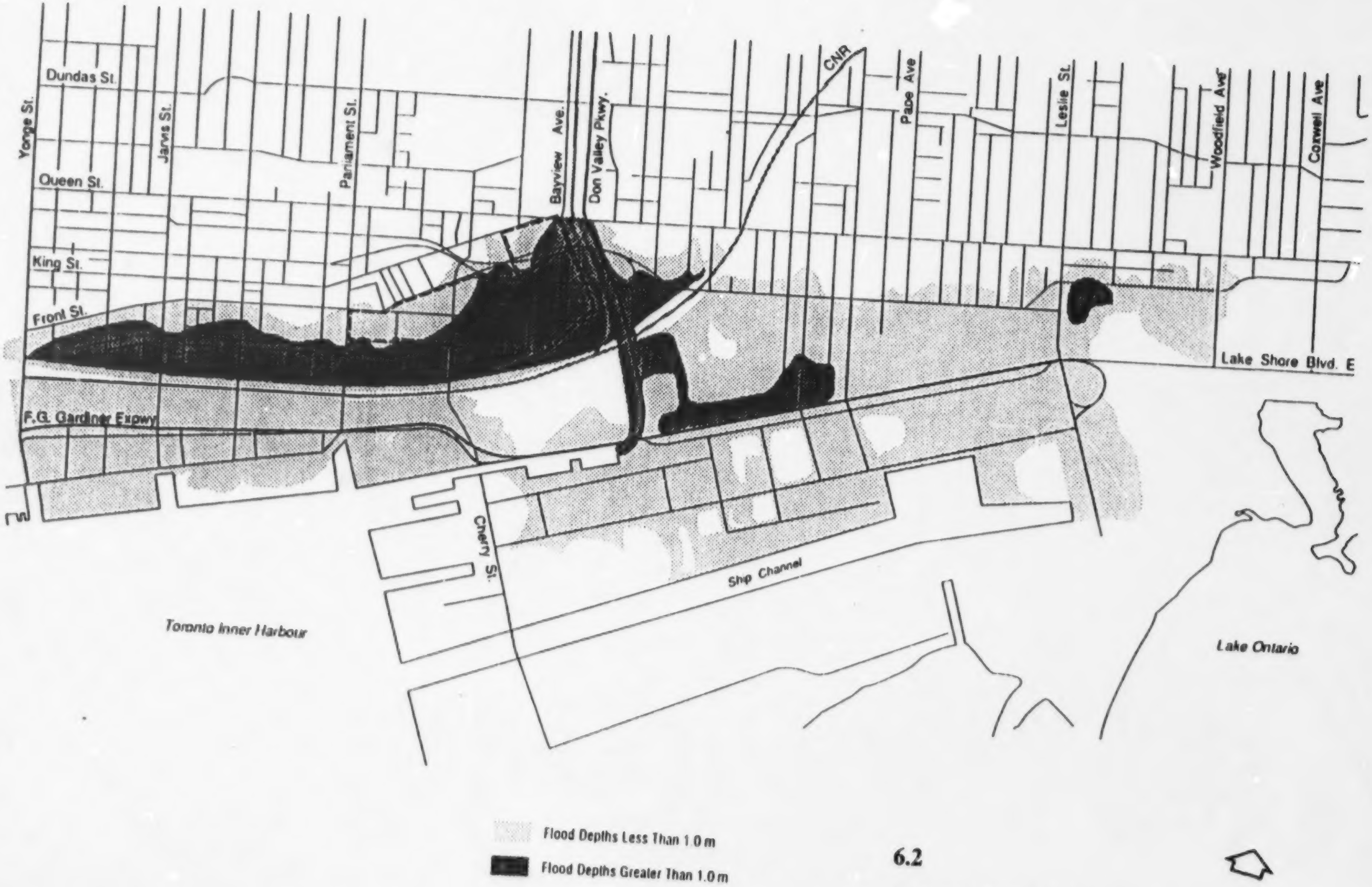
6.3 Evaluation of Existing Flood Risks

The Regional Storm has been defined for the Toronto area as a storm with the same amount and distribution of rainfall as that produced by Hurricane Hazel in 1954. This would normally determine the Regulatory Flood level to which new development/redevelopment in a flood plain must be protected. In the case of the Don River, the assumption is made that the Regional Storm would be centred over its watershed, rather than over the Humber River watershed as was the case in 1954.

To evaluate flood levels and flow patterns at Ataratiri, a two-dimensional model, specifically adapted to urban flood plain analysis has been used. This choice was partly influenced by the results of a study commissioned by the MNR involving a physical hydraulic model of Ataratiri (Paragon, 1990).

There currently are many buildings on the lower Don flood plain that require protection. Almost 3800 dwelling units are susceptible to flooding under a Regional Storm. More than 900 businesses employing over 23,000 workers are flood vulnerable. The area currently at risk from the Regional Flood extends to the east past Leslie Street and to Bay Street in the west (a total of approximately 290 hectares or 720 acres). The peak Regional Flood level upstream of the CNR tracks has been determined to be 79.57 m.

An estimated flow of 1460 m^3/s at the Queen Street East bridge is predicted for the Don River during a Regional Storm. This is approximately seven times higher than the maximum flow recorded for the lower Don during the 45 years that measurements have


Yonge St.
Dundas St.
Queen St.
King St.
Front St.
Jarvis St.
Parliament St.
Bayview Ave.
Don Valley Pkwy.
CNR
Pape Ave
Leslie St.
Woodfield Ave
Coxwell Ave
Lake Shore Blvd. E
F.G. Gardiner Expwy
Cherry St.
Ship Channel
Toronto Inner Harbour
Lake Ontario
Flood Depths Less Than 1.0 m
Flood Depths Greater Than 1.0 m

6.2

Extent of Flood Under Regional Storm - Existing Conditions

ATARATIRI
Environmental Evaluation Study Report
September 1991

been taken. Protecting to the level of the Regional Storm, therefore, anticipates a "worst case" scenario.

As shown in Figure 6.2, flood depths greater than 1 m during a Regional Storm cover substantial areas west of the Don River and north of the CNR embankment as far west as Bay Street and including the Ataratiri site. South of the tracks, the area flooded to depths greater than 1 m is limited to the vicinity of Lakeshore Blvd. East between Cherry Street and Parliament Street.

The majority of the flood plain east of the Don and south of the Keating Channel is flooded to depths of less than 1 m. Flood depths exceed 1 m adjacent to the east bank of the River in the vicinity of the railway siding and at a low-lying area near Leslie Street north of Lakeshore Blvd. East. The area of flooding east of the Don extends almost to Ashbridges Bay.

6.4 Flood Risk Control Measures and Strategies

6.4.1 Types of Measures Considered

The two-dimensional mathematical model noted in Section 6.3 was used to investigate the effectiveness of six flood risk control measures during a Regional Flood:

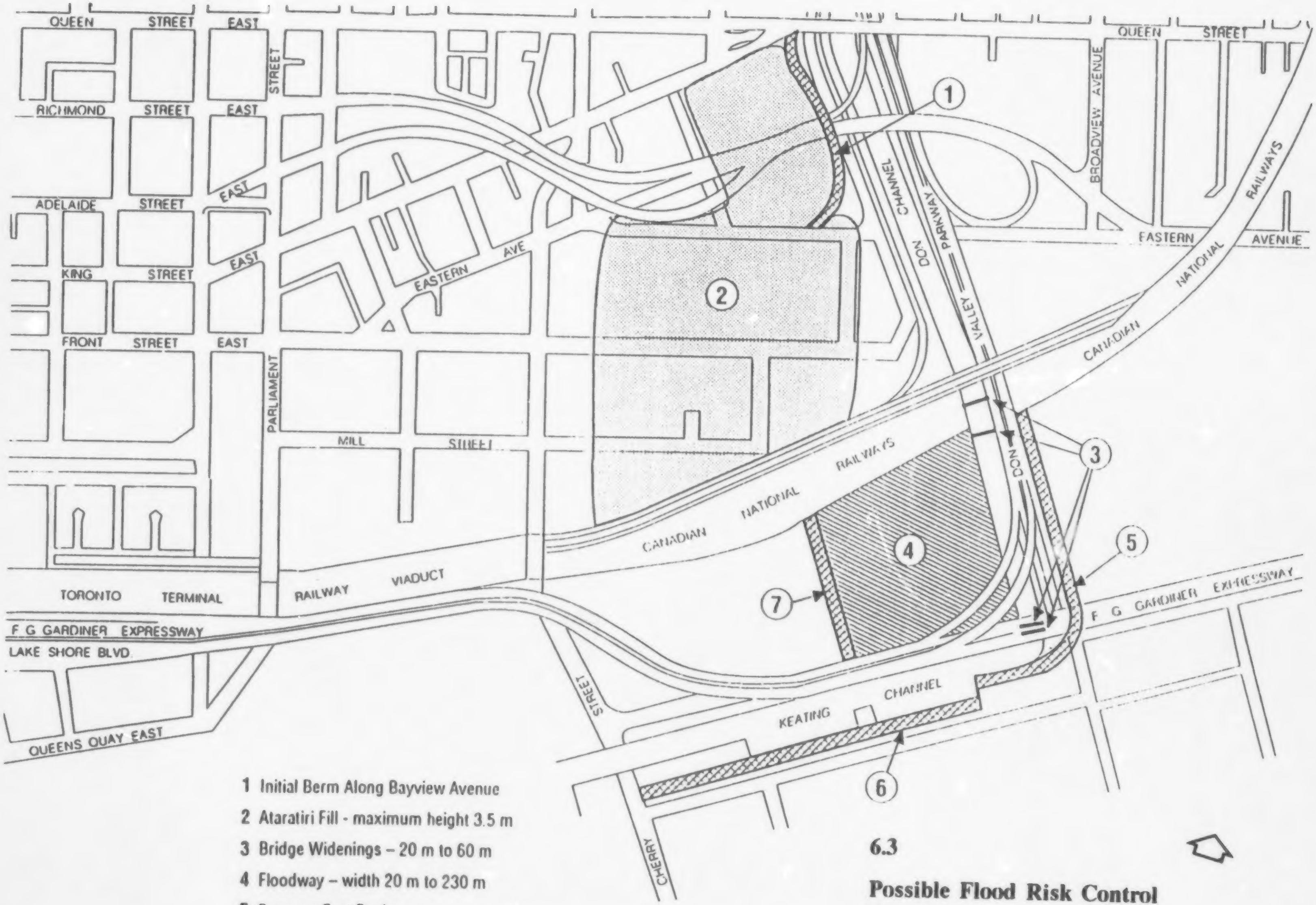
A. Placement of fill (to raise grades to a maximum of 3.5 m) on the west bank of the Don River, plus construction of a 5 m wide culvert through the north-south GO train/CN railway embankment. The culvert would permit the area behind the embankment to drain while also creating access from Ataratiri to the Don River.

B. Measure A plus removal of the utility bridge to the north of the CNR bridge and the old Eastern Avenue bridge.

C. Measure B plus a 20 m widening of the opening of the existing CNR bridge, and excavation of a 20 m wide floodway to the west of the Don River from the new opening under the CNR line to Lakeshore Blvd. East at the Keating Channel. The invert of the floodway would be about 2 m above normal water level in the channel.

D. Measure C plus the addition of a berm along the eastern limit of the Don Valley Parkway from the CNR embankment to the Keating Channel.

E. Measure C except that the opening immediately to the west of the CNR bridge will be 60 m wide, and the floodway adjacent to the west bank of the Don River will be 60 m wide.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RICHMOND STREET EAST
ADELAIDE STREET EAST
KING STREET EAST
FRONT STREET EAST
PARLIAMENT STREET
EASTERN AVE
MILL STREET
TORONTO TERMINAL RAILWAY VIADUCT
F G GARDINER EXPRESSWAY
LAKE SHORE BLVD.
QUEENS QUAY EAST
CANADIAN NATIONAL RAILWAYS
DON VALLEY PARKWAY
DON CHANNEL
DON
BROADVIEW AVENUE
EASTERN AVENUE
QUEEN STREET
KEATING CHANNEL
CHERRY STREET
1
2
3
4
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7

1 Initial Berm Along Bayview Avenue
2 Ataratiri Fill - maximum height 3.5 m
3 Bridge Widenings – 20 m to 60 m
4 Floodway – width 20 m to 230 m
5 Berm on East Bank
6 Berm on South Side of Keating Channel (minimum width 15 m)
7 Berm on West Side of Floodway

6.3

Possible Flood Risk Control Measures

ATARATIRI
Environmental Evaluation Study Report

F. The complete flood protection scheme proposed in a parallel study sponsored by the MNR in which a physical hydraulic model of the lower Don River flood plain was constructed (Paragon, 1990).

The locations of some of these flood risk control measures are shown in Figure 6.3. The results of modelling these potential control measures reveal several important aspects of current and future flood conditions at Ataratiri.

Under existing conditions, a considerable area east and west of the River would be at risk during the Regional Flood (see Figure 6.2). The proposed placement of fill would considerably reduce the area of the spill zone on the west side of the Don. Flood water would extend only slightly west of Cherry Street. This would protect most of the existing development that is currently vulnerable to flooding. The displaced water, however, would be forced eastward, expanding the area flooded on that side of the Don. This would create a trade-off between protection of the highly valued and intensely developed lands between Parliament Street and Bay Street currently subject to flood depths over 1 m and the small increase in flood depths and extent on the less intensely developed lands east of the Don. The fill only option (Measure A), therefore, has been eliminated from further consideration (see Section 6.4.2).

Backwater simulations of the Don River indicate that there would be negligible change in peak flood levels if the utility bridge and the old Eastern Avenue bridge were removed. These simulations included the placement of fill placed along the west bank of the Don. While the computer model used to estimate flood levels can not show highly localized effects, the physical model suggested that water level increases of almost 1 m could occur on the upstream faces of bridges (Paragon, 1990). by the time flood waters have reached a depth where this is occurring, the horizontal extent of the flood plain is such that the impact is indeed localized. Removing the utility bridge also would remove the services it carries which currently can be damaged during a severe floods (see Section 7.4.4).

With the fill in place, widening the CNR bridge opening by 20 m over the west bank and constructing a 20 m wide floodway from the CNR bridge to the Keating Channel would completely protect Ataratiri and all lands to the west from the Regional Flood. Flood levels along the river would be reduced to somewhat less than those which occur under existing conditions. Widening the CNR bridge by 20 m would reduce flood depths east of the Don to levels below existing conditions. The addition of a berm along the eastern limit of the Don Valley Parkway from the CNR embankment to the Keating Channel would provide further protection to the spill zone east of the Don and south of the CNR embankment. The area of this spill zone would be significantly reduced from existing conditions and flood depths would be less than 1 m. Ataratiri would still be completely protected from the Regional Flood.

Widening the CNR bridge by 60 m over the west bank of the Don and constructing a 60 m wide floodway to the Keating Channel would decrease peak flood levels upstream of the CNR Bridge by approximately 0.9 m from existing levels. Ataratiri would be completely protected from the Regional Flood although no additional protection would be provided to the Ataratiri site over that given by Measure D (fill plus 20 m opening). Flood depths in the eastern spill zone north of the CNR embankment would be less than 1 m. A substantial spill zone would still occur south of the CNR embankment east of the Don, however, most of this zone would have flood depths of less than 1 m.

The flood protection scheme developed from a parallel study using a physical model would provide the greatest level of protection for the entire lower Don River flood plain. No additional protection would be provided to the Ataratiri site over that given by Measure D (fill plus 20 m opening). The only area remaining at risk from the Regional Flood would be the east overbank area north of the CNR embankment. This area can not be protected because it contains access roads for the Don Valley Parkway. Flood depths would be less than 1 m.

6.4.2 The Preferred Management Plan

Based on the results of the two-dimensional modelling and physical modelling, a set of principles and procedures have been recommended which will provide the basis for further discussion among SPA Technical Committee members and other affected agencies. The principles and procedures will be refined and adjusted as detailed implementation strategies are formulated.

The "minimum flood protection package" for the lower Don River will include: filling part of the Ataratiri site to raise grades a maximum of 3.5 m, widening the openings of the CNR bridge and the downstream bridges by approximately 20 m, plus constructing a floodway of a similar width south of the CNR bridge, all totalling an estimated $15.3 million in engineering costs. Associated environmental costs could be another $5 million. The value of properties that might need to be acquired have not been estimated.

The minimum flood protection package will not exclude the possibility of more extensive protection packages if deemed necessary by the SPA Technical Committee members necessary to provide a higher level of protection for other parts of the lower Don. The benefits of the minimum flood package extend beyond the limits of Ataratiri. A more extensive package of measures will only address areas east of the Don and south of the east-west rail corridor. Any lands within the lower Don flood plain that are identified by the SPA Technical Committee as being required for potential flood protection will be reserved or designated for this purpose.

Any solution for the lower Don must include ongoing maintenance dredging of the Keating Channel for as long as required. The existing dredging agreement among the Federal government, Toronto Harbour Commissioners, and MTRCA expires in 1991. A new, long-term agreement must be negotiated which will include the identification of new funding partners, including the City of Toronto.

A meeting (or series of meetings) will be held to discuss a new agreement for dredging the Keating Channel. Affected parties, including Metro, the City, MNR, Toronto Harbour Commissioners, the Royal Commission on the Future of the Toronto Waterfront, the Ministry of Transportation, and Transport Canada should participate in these discussions (see Section 6.4.4).

The City, with the agreement of the SPA Technical Committee, will begin, at the earliest possible time, an engineering feasibility study of placing fill on the Ataratiri site, including the phasing of the fill. MNR and MTRCA engineering staff will continue to be consulted during the study.

Filling of the site will be done in step with the proposed phasing of new construction. New development may be permitted on the condition that the proposed development is flood protected to the level of the Regulatory Flood. Where this is not technically feasible, or it is impractical, a lower level of flood protection may be permitted. In all cases, however, new development shall be flood protected to at least the level of the 1-in-350 year flood.

Construction of any earth fill works will not start until a remediation strategy for the underlying soil has been agreed upon with MOE and any required soil remediation has been completed.

The entire minimum flood protection package will be implemented in the most expeditious manner possible. Priority will be given to the bridge widenings and off-site floodway construction. The City, in consultation with the other SPA Technical Committee members, has undertaken an engineering feasibility study of the downstream flood works. It will consider the downstream works included in the minimum flood protection package, as well as the other options described in Section 6.4.1. The study will produce a more detailed cost estimate of the works, their engineering requirements, timing and approval requirements. As part of the study, preliminary discussions will begin immediately with bridge owners, utility companies, property owners, and other affected parties.

On the basis of the engineering study results, the SPA Technical Committee may decide on a flood protection package that is more extensive than the minimum package recommended.

Concurrent with the recommended engineering study, discussions will be started with all appropriate parties regarding the allocation of costs, mechanisms for funding a comprehensive flood mitigation package, and ways to recoup potential front end expenditures. The MMA will coordinate these discussions. Any financial agreement resulting from the above discussions must include a Keating Channel agreement. The City agrees with the principle of contributing to the costs of the Keating Channel dredging as well as the other flood remedial works.

The City should manage the design, construction and maintenance of all flood remedial works located on the Ataratiri site. The project manager for all other flood protection works should be the MTRCA.

The flood remedial works located outside of the Ataratiri site are not currently included in the Exemption Order for Ataratiri. The City shall apply immediately to the MOE to amend the Exemption Order to include any off-site undertakings that may otherwise be subject to an Environmental Assessment. The City shall also immediately investigate possible federal approval requirements.

6.4.3 Residual Risks

Since floods are natural and random events, there is always a risk, no matter how small, that an event will occur which is larger than a selected level of flood protection. The objective is to reduce the risk to an acceptable level and to recognize and plan for the residual risk.

When the minimum flood protection package is in place, all of Ataratiri and the area of existing development to the west that is outside of the floodway created by the fill will be dry floodproofed against the Regional Storm. Building-specific flood damage reduction measures will not be necessary. Under these circumstances, flooding could only occur during a storm more severe than the Regional Storm. While this is a statistical possibility, the Regional Storm flow is approximately seven times greater than the maximum flow recorded for the lower Don in the past 45 years that measurements have been taken.

Until all components of the minimum flood protection package have been completed, there is a risk of flooding in Ataratiri under storm conditions less severe than the Regional Storm. The minimum level of protection provided, however, will be the level of the 1-in-350 year flood. Protection to this lower level will be for a limited period of time; at project completion, all of Ataratiri will be provided with Regional Flood protection.

Until project completion, it will be necessary to ensure that any area containing a sensitive use is adequately designed and protected against any residual flooding that would result from a Regional Storm event. For example, as existing buildings in Ataratiri are demolished to allow for redevelopment, any PCB wastes discovered on-site will have to be moved to a secure location. A PCB waste storage facility on Ataratiri will have to be protected against flooding, at least for the immediate future (in the longer term, it may be possible for the City to establish a central facility off-site for all municipally-generated PCB wastes).

Since development within Ataratiri will be occurring simultaneously with the construction of the flood remedial works and the placing of the fill, some existing structures, such as the heritage building at 409 Front Street East, will be temporarily susceptible to flooding under extreme storm conditions. To protect against the possibility of flood damage during this interim period, additional measures should be undertaken when buildings are renovated. As a minimum, protection to the level of the 1-in-350 year flood is recommended in accordance with established MTRCA policy. Once Ataratiri and all of the associated flood works are completed, these initial flood damage reduction measures will become redundant.

6.4.4 Potential Environmental Impacts of the Preferred Management Plan

The potential environmental impacts of the preferred flood management plan include:

- effects on flood levels in other parts of the lower Don flood plain;
- site access;
- aesthetics;
- air quality;
- noise and vibration;
- ground water and storm water; and
- the need to continue to dredge the Keating Channel.

The preferred flood management plan would remove virtually all of the spill zone west of the river and south of the east-west rail corridor from the lower Don flood plain. The total number of dwelling units west of Cherry Street susceptible to flooding would be lessened by 70%. The number of potentially flooded businesses would be reduced by 50%, as would the number of affected employees. Much of this area currently is susceptible to flood depths in excess of 1 m. This depth is significant according to provincial flood plain planning policies because it represents the upper limit for emergency evacuation and personal safety. Flood waters deeper than 1 m are associated with increased risk of loss of life. Most of the St. Lawrence Neighbourhood is currently vulnerable to flooding of this magnitude. In addition to 2700 housing units (accommodating approximately 5400 residents), there are two elementary schools, a day care centre, a hydro transformer substation and other utilities, and community facilities that are threatened by severe flooding. With the preferred flood management plan in place, all of St. Lawrence would be dry under a Regional Storm.

The preferred flood management plan for Ataratiri also would cause an increase of flooding, under Regional Storm conditions, in the two spill zones east of the Don River if no other remedial works were undertaken. Expansion of the existing flood plain would mostly occur through finger-like extensions north of Eastern Avenue, affecting approximately 361 additional dwelling units. The maximum increase in flood depths would be 0.2 m in the area east and south of the CNR line, and 0.5 m in the triangle of land between the east bank of the Don and the CNR line.

Provincial and MTRCA policies prohibit any actions in a flood plain that have adverse upstream or downstream impacts. The beneficial impacts of the proposed Ataratiri fill, in terms of the properties affected, far outweigh the negative impacts described above. Nevertheless, it is important that all adverse effects be eliminated. It is estimated that the proposed bridge widenings and floodway construction would lower flood levels under the Regional Storm and more than compensate for the impact of the Ataratiri fill. The lower Don at present does not have a distinguishable floodway and flood fringe. The effect of the proposed remedial works will be to create an artificial floodway along the west bank of the Don which will be able to carry most of the flows caused by a Regional Storm.

Using fill to raise grades as much as 3.5 m may effect site access and aesthetics. The planned realignment of Bayview Avenue will have to rise over the fill. At a maximum grade of 5 to 6%, a horizontal run of approximately 50 to 100 m may be required depending upon the fill elevation at the roadway location.

Site planning studies have been undertaken to determine the most aesthetically pleasing location for the eastern boundary of the fill. The proposed configuration which places the edge of the fill between 100 and 200 m from the river, will provide the opportunity to create a natural open space next to the river, provide a point to overlook the river valley, and provide access to the new park. The approach is, therefore, consistent with the goal of the Neighbourhood Advisory Council of restoring the Don River to a more natural state.

The raising of the grade has the potential to affect air quality and noise levels at the site. The effects of the proposed grade on local air quality are expected to be subtle and not easily incorporated into the mathematical models described in Chapter 2. Other changes in and around Ataratiri such as the removal of industrial emission sources and the microclimates caused by buildings will be far greater influences on air quality.

The proposed raising of grades would provide shielding against the noise sources east of the site including the Don Valley Parkway and the rail corridor. The resulting reduction in noise levels is not expected to be more than 3 to 5 dBA. The largest reductions would occur at ground level and rapidly decrease at higher elevations. Raising the grades in the eastern part of Ataratiri would have no effect on noise levels in the western part of the site. The impact of the proposed grade changes would be relatively small compared with those associated with the shielding provided by buildings, the use of acoustic insulation, and proposed setback distances (see Section 3.6).

The placement of fill on the site also may affect the local water table elevations and ground water chemistry. Water table elevations may rise locally due to the presence of the fill depending upon the type of material used. This may be offset by infiltration into storm and sanitary sewers and the flow of ground water along the boundary between the existing material and the new fill material. The nature of such possible changes should be investigated.

Redevelopment of the Ataratiri site will provide opportunities to alter storm water drainage and to manage runoff at Ataratiri. The use of underground tanks or other devices to temporarily hold storm water is being studied as part of planning new storm water services for Ataratiri (see Section 5.6.3).

The Keating Channel has required regular dredging since it was constructed in 1920. Dredging has a significant impact, reducing potential flood depths along the lower Don River and is necessary to maintain navigable depths in portions of the harbour. The proposed flood management plan requires regular maintenance dredging of the Keating Channel to ensure the design flood level is maintained. The existing dredging agreement among the Federal government, Toronto Harbour Commissioners, and MTRCA expires in 1991. A new, long-term agreement must be negotiated which will include the identification of new funding partners, including the City of Toronto. The annual cost of dredging is estimated to be $500,000 to $600,000.

The disposal of dredged material will require environmental approvals once the capacity of the existing disposal sites are filled, an estimated 40 years in the future. The 1983 Keating Channel Environmental Assessment (Acres, 1983) provided for long-term disposal capacity for the dredged material, however, changes in the requirements for disposal, such as guidelines for the quality of the dredged material that can be disposed of in the approved sites, could significantly impact dredging.

Watershed improvements brought about by initiatives such as those of the Task Force to Bring Back the Don could, in the long term, result in improvements to the dredged material such that special handling may no longer be required.

The Keating Channel Environmental Assessment also lists maintenance dredging as a requirement to protect parts of the Port Industrial District from flooding for storms up to the 1-in-150 year event.

6.4.5 Soil Remediation and the Preferred Management Plan

It is proposed that the flood remedial works be done in phases. Work will begin as soon as possible on the required bridge widenings and floodway construction. No grades need to be raised for the first phase of development, which is proposed to occur west of Cherry Street. The majority of this area is outside the limits of the 1-in-350 year flood.

As development proceeds in a general west-to-east direction past Cherry Street, soil would be remediated and excavation for new buildings started. Below-grade services would be located along the proposed street grid and the roads (new and existing) would be constructed on top of the required level of compacted fill. During the construction of each development block, finished grades would be brought up to the recommended flood elevation. With the completion of the most easterly development blocks, a continuous gradient would be achieved from approximately Cherry Street to the easterly limit of an extended River Street.

6.5 Recommendations for Further Studies

The preferred flood management plan described in Section 6.4.2 identifies several studies that will need to be undertaken before all of the outstanding flood protection issues for Ataratiri and other areas in the lower Don flood plain are resolved:

- No special environmental approvals beyond those arising from the conditions of the Ataratiri Exemption Order are required for the proposed raising of site grades, however, associated, off-site flood protection measures are not covered by the Exemption Order. Undertakings of this scale and nature are normally subject to an environmental assessment under the Environmental Assessment Act. At the time that the Exemption Order was issued, the complexity and extent of flooding in the lower Don was not fully understood. The authors of the Exemption Order, therefore, could not have anticipated the need for off-site undertakings to protect Ataratiri from flooding. City staff have already contacted MOE staff regarding possible amendments or additions to the Exemption Order to include these protective measures. Since the CNR bridge comes under a federal government authority, there may be a need for another level of approvals. The timely implementation of the recommended flood protection package will largely depend on how quickly all environmental approvals can be obtained.

- Site planning studies will determine the most visual/aesthetically pleasing treatment of the fill. Locating the edge of the fill between 100 and 200 m from the river would provide the opportunity to create a natural open space next to the river.

- The exact form of the master plan for full protection to the level of the Regional Storm for the entire lower Don flood plain will require further consideration of the costs and benefits of the different options. Specifically, it must be determined whether complete dry protection against the Regional Flood is required throughout the flood plain or whether protection which gives depths of flooding less than 1 m is adequate.

- The placement of fill on the site also may affect the local water table elevations and ground water chemistry. The nature of such possible changes should be investigated.

7.0 TRANSPORTATION AND FIXED FACILITIES RISKS

7.1 Overview

Many of the industrial and commercial activities currently undertaken in and around Ataratiri can be sources of risk due to the transporting, storing, and handling of hazardous materials. Redevelopment of Ataratiri will eliminate or modify some of these sources of risk, but may also introduce new ones.

Condition 2 of the Ataratiri Exemption Order requires that the risks of injury or damage from accidents on road and rail corridors in the vicinity of the site be analyzed. In response, the City retained Concord Environmental to carry out several studies related to the risks posed by the transportation and use of dangerous goods in and around Ataratiri:

- identify existing sources of risk from accidents involving dangerous goods on transportation corridors and at fixed facilities (such as storage tanks and pipelines);
- estimate the risks from these sources to future residents of Ataratiri;
- compare the estimated risks in Ataratiri to risks in other areas of Toronto where there are similar hazards; and
- identify risk management options for reducing unacceptable levels of risk.

To assess the risks to future residents of Ataratiri, Concord Environmental examined potentially hazardous incidents caused by the road and rail transport of dangerous goods, marine facilities, and fixed facilities. The focus was on incidents which could result in fire, explosion, or the release of dangerous materials. The risks of automobile accidents involving pedestrians have not been addressed.

This chapter summarizes the findings presented in the Concord Environmental report (1990a) and a report addendum (1991). It provides a brief overview of risk management in urban settings; identifies hazards present at Ataratiri; estimates the frequencies of various types of accidents; describes potential remedial options and strategies; and recommends further studies that may be necessary as the design of Ataratiri evolves.

Several basic terms are used throughout the chapter. **Risk** is defined as a measure of the probability and severity of an adverse effect to health, property, or the environment. Risks are expressed as estimates of the likelihood or statistical probability of harm occurring as a result of exposure to a risk agent. The types of effects that are considered most often include death, injury, and property damage. For Ataratiri, the measure of risk is taken as immediate death, as is the practice in this type of risk study. Injury covers a broad range of outcomes which are not easily quantifiable, and which generally are not known. (Property damage such as broken windows caused by explosions, are addressed in the full background report and addendum but are not presented in this chapter.)

Another important aspect of risk is the number of persons involved. This provides another basis for defining risk-related terms. **Individual risk** is the probability that an individual will experience a specific adverse effect as a result of exposure to a specific hazard. A risk of one chance in a million means that the individual has one chance in one million of dying as a result of exposure to a specific hazard. **Societal risk** is the sum of all the individual risks within an exposed population.

Discussion of risk also needs to indicate whether the risks are described in absolute or relative terms. **Absolute risk** is the frequency of a specified adverse effect occurring from all possible events associated with a hazardous activity. An example would be the estimated number of fatalities per year from all possible hazardous releases due to dangerous goods movement in the area. **Relative risk** is the risk of the exposed population compared to the risk in an unexposed (or differently exposed) population. (This is similar to the comparative risks discussed in Section 4.6.1.) It also can be the ratio of risks experienced by the same population for different exposure scenarios.

Risk management is a decision process that uses risk estimates together with information about technical resources, available solutions, and social, economic, and political priorities to determine which actions are best for reducing or eliminating risks. Risk management also includes the design and implementation of policies and strategies that result from the decisions that are made.

7.2 Risk Management in Urban Settings

7.2.1 Sources of Urban Risks

The Ataratiri area contains many of the sources of risks typically found in urban areas. Several major roadways and expressways run through or near Ataratiri. Rail lines pass along two sides of the site. Major fixed facilities in the vicinity of the site include an active marine terminal area and pipelines that carry petroleum products and natural gas. All of these are potential sources of risk to Ataratiri residents and visitors.

The types of potential hazards investigated include releases of hazardous materials due to vehicle accidents, vehicle/train accidents, train derailments (which can lead to buildings being damaged), and equipment failures. All of the risks associated with transportation activities can happen anywhere along transportation routes.

The storage and handling of hazardous materials at fixed facilities can lead to risks as a result of the accidental releases of hazardous materials. Pipelines are a special class of fixed facility and numerous pipelines are known or suspected to cross Ataratiri. Pipelines can fail due to deterioration, or be punctured by excavation and maintenance activities. Several of the bridges adjacent the eastern edge of Ataratiri that cross the Don River carry utilities including natural gas, electricity, telephone lines, and water. Damage to these bridges that may occur during flooding could result in fires, explosions, or the severing of important services during such events. In the case of the telephone lines, backup circuits exist that would minimize service disruption.

The risks associated with marine terminal facilities are a combination of those associated with transportation facilities and fixed facilities.

7.2.2 Risk Criteria and Acceptability of Risk

Defining "acceptable" levels of risk involve personal and social value judgements. Formalized guidelines or criteria for establishing acceptable public risks from hazardous facilities do not exist in Canada. Guidance on the acceptable level of risks can be obtained from the literature and the experience of other governments and organizations. For example, the following criteria have been suggested for several levels of risk (Royal Society Study Group, 1983; Health and Safety Executive, 1988):

- 1 in 1,000 per year is an intolerable level of individual risk, even when the persons exposed judge that they benefit from the activity. (Risky sports and occupations fall into this category.)
- 1 in 10,000 per year is an intolerable level for any individual member of the public. (This is comparable to the annual average risk of dying in a traffic accident.)
- 1 in 100,000 per year is maximum acceptable individual risk.
- 1 in 1,000,000 per year is the level below which risks could be legitimately regarded as trivial.

In evaluating the acceptability of risks posed by a facility, many other factors should be considered carefully. These include economic, social, and political considerations. It is also important to consider not only the levels of individual risk, but also the levels of risk to the public at large.

In considering risk evaluation criteria, it is important to understand that risk assessment is a developing field of endeavour and that universally accepted procedures and guidelines do not yet exist; however, risk assessment has proven to be a useful way of analyzing alternative courses of action and can provide a consistent framework for organizing information and estimating adverse consequences. Conversely, risk assessments can give a false sense of precision or accuracy if the large uncertainties associated with making the estimates are not clearly understood.

Table 7.1

SOME COMMON INVOLUNTARY RISKS IN CANADA AND METROPOLITAN TORONTO

	Individual Risk[5]	
Cause or Hazard	**Canada[1]**	**Metropolitan Toronto[2]**
Motor Vehicle Accidents	159	75[3]
Falls	75	102
Fires	20	12[4]
Poisoning	15	28
Excessive Cold	4.4	N/A[6]
Cataclysmic Storms	0.3	0
Lightning	0.2	0

Notes:

- All risks expressed per one million persons annually

1 Data are for a three year period (1984-86).

2 Data are for a two year period (1985-86) from Registrar General, Province of Ontario publication *Cause of Death for Metropolitan Toronto*.

3 This figure represents the individual risk of death by motor vehicle accidents for Metro Toronto residents only and would be higher if non-resident drivers killed in motor vehicle accidents were included.

4 Data for 1988 from the Office of the Fire Marshall.

5 Based on population figures from Ministry of Supply and Services (1987).

6 N/A = not available.

Table 7.2

SOCIETAL RISKS IN THE CITY OF TORONTO[1]

Cause or Hazard[1]	Fatalities per Year	Frequency of Fatalities
Motor Vehicle Accidents	46/97[2]	1 per 8.0/3.8 days
Falls	62	1 per 5.9 days
Poisoning	17	1 per 21 days
Fires	7	1 per 50 days
Dangerous Goods Rail Transport	0.32	1 per 1141 days

Notes:

1 Sources of data as per Table 7.1, except population data for City of Toronto which was obtained from the City of Toronto Planning and Development Department. Risks from the rail transport of dangerous goods were estimated in the background study for the EES report (Concord, 1990a).

2 The first value is the actual number of fatalities recorded in Metro extrapolated to the City and the second value is the actual Canada-wide statistic extrapolated to the City. This has been done because the Metro Toronto statistics include only those who resided in Metro and were killed as a result of motor vehicle accidents, and not the total number of fatalities which would obviously be greater.

It often is useful to compare estimated risk values with the risks encountered in other activities. The levels of some common individual risks which people experience in everyday life in Canada and Metropolitan Toronto are shown on Table 7.1, and the levels of societal risk in the City of Toronto are shown on Table 7.2.

7.3 Hazards at Ataratiri

7.3.1 Hazardous Materials Inventory

Various hazardous materials are transported, stored, or handled by facilities in the vicinity of Ataratiri. An inventory of hazardous materials was compiled in 1989 from several sources including dangerous goods statistics from railways, counts of placards on vehicles travelling local roads, hazardous materials data from marine shipments, Toronto Fire Department records, and information concerning nearby industrial processes. This inventory revealed a diverse group of materials which were organized into six classes for further evaluation. The six classes and the materials selected to represent the hazards for each class are:

hazardous material class	representative material
explosives	black powder
flammable liquefied gases	propane
toxic or corrosive gases	chlorine and ammonia
flammable liquids	gasoline
spontaneously flammable solids	phosphorus
poisonous substances	oleum

The inventory provided sufficient information for all of the representative materials to be included in the hazard evaluation of rail traffic. For road traffic hazards, only propane, chlorine, and gasoline could be considered. For marine facilities, only gasoline was identified and could be evaluated.

7.3.2 Acute Toxicity Hazards

Acute toxicity hazards are posed by toxic materials in gas or liquid forms that can be released as a gas or mist and subsequently be inhaled. Liquefied gases pose a special hazard because they form heavier-than-air gas clouds when released to the atmosphere. Such clouds can cover large areas at hazardous concentrations near grade. The severity of the toxic effect depends on the material, the concentration of the material, the length of time that exposure occurs, and the exposed individual's susceptibility. Materials capable of causing acute toxicity hazards can be dispersed in the atmosphere, potentially affecting large areas and/or populations. Two of the representative materials, chlorine and ammonia, are usually transported as liquefied gases.

7.3.3 Flammability Hazards

Flammable gases and flammable liquefied gases, if released, may form flammable clouds that disperse in the atmosphere. If ignited, such clouds will result in a flash fire that engulfs the area covered by the cloud.

7.3.4 Thermal Radiation Hazards

The ignition of flammable material results in a thermal radiation hazard around the fire. The severity of the hazard depends upon the flame size, radiation intensity, and exposure time. Three types of thermal radiation hazards were evaluated for Ataratiri:

- pool fires that result from the ignition of a pool of flammable liquid;
- jet fires that result from the ignition of a pressurized discharge of flammable material; and,
- fireballs that result from the immediate ignition of vapour or vapour-entrained liquid released from a pressurized container.

7.3.5 Blast Wave Hazards

There are five types of blast wave hazards associated with the handling of hazardous materials. For this study, three were included in the analysis for Ataratiri.

- Boiling Liquid Expanding Vapour Explosions (BLEVEs) occur when a liquefied gas forms a vapour by flash evaporation. When the vapour formation rate is sufficiently high, blast waves are produced.
- Detonations are violent explosions such as those caused by dynamite and other explosives.
- Confined Explosions are the result of flammable mixtures igniting in confined spaces. An example is the ignition of residual vapour fumes in a closed tank.

Two types of blast wave hazards not considered for Ataratiri are unconfined vapour cloud explosions and projectile hazards. Unconfined vapour cloud explosions are not considered because they are extremely rare events. Projectile hazards are difficult to assess accurately and were excluded because their contribution is generally small compared to other hazards.

7.3.6 Physical Impact Hazards

Examples of physical impact incidents include collisions between a railcar or road vehicle and buildings. These are localized and highly dependent upon the nature and location of the objects in collision. Because these details are not yet available for Ataratiri, it is not possible to estimate (with any confidence) these impacts and, therefore, they have not been addressed.

7.3.7 Flood Damage Hazards

Several of the bridges that cross the Don River carry utilities that could be damaged or ruptured during floods. The hazards from flood damage depend upon the type of utility involved. Damage to the natural gas pipelines carried by the utility bridge just north of Eastern Avenue bridge and the Toronto Transit Rail bridge (just north of Lake Shore Boulevard) could produce blast waves (due to explosions) and jet fires if the gas is ignited.

Damage to the electricity, telephone, and water lines carried by several bridges across the Don would not present a direct hazard to Ataratiri residents but could result in the temporary loss of these services.

7.4 Accident Frequencies at Ataratiri

7.4.1 Road Accidents

To assess the frequencies of accidents on the roads in the vicinity of Ataratiri, information was gathered concerning traffic volumes, turning movements, operating speeds, automobile/truck ratios, and accident data for the following routes: the Don Valley Parkway, the Gardiner Expressway, Eastern Avenue, Front Street East, Lake Shore Boulevard, Bayview Avenue, Cherry Street, and Parliament Street. In addition, a brief survey of placarded vehicles (i.e. those carrying dangerous goods) was made in August 1989 to ascertain the approximate movement of hazardous materials on each of these routes.

7.4.2 Rail Accidents

To assess the frequencies of accidents on rail lines located south and east of Ataratiri, data was compiled on physical track characteristics, tank car characteristics, operational procedures, numbers and frequencies of dangerous goods shipments, and accident frequency rates.

7.4.3 Marine Terminal and Fixed Facility Accidents

The scarcity of information available on hazards related to either of these type of facilities prevented the development of accident data. However, it was possible to assess some hazards on a generic basis.

There are several possible causes of pipeline leakage or rupture. Corrosion can occur, but high pressure lines are inspected frequently so the likelihood of leakage or rupture due to corrosion is very small. Damage to a pipeline during activities such as excavation are unlikely since pipeline routes are marked. Pipeline damage associated with flooding is discussed in Section 7.4.4.

Regardless of the cause of pipeline leakage or rupture, an ignition source is needed to result in an explosion or fire. Possible ignition sources include electrical switches and fixtures; sparks generated by falling debris striking a pipeline; vehicles that enter a gas cloud; matches; and cigarettes.

Risks at marine terminals were assessed using data about the types of materials handled, their volumes, and nature of the material. The largest volume of hazardous material handled is gasoline. An accident scenario involving a gasoline fire in the Ship Channel was developed to assess the potential effects on Ataratiri (see Section 7.8).

Fire records for fixed facilities were examined to gain a perspective on the range and magnitude of fire-related events. This information was combined with information about materials handled at the facility to arrive at a "fire index". Similarly, a "toxic index" was calculated for the inhalation of hazardous materials at each facility. The information used to calculate the toxic index takes into account the volume of material and its volatility.

7.4.4 Accidents Associated with Flooding

The buoyancy forces exerted on buried pipelines during floods could potentially cause leakage or ruptures. The flood protection plan discussed in Chapter 6 would virtually eliminate this possibility at Ataratiri.

Pipelines that cross bridges can be damaged during flood events. As mentioned in Section 7.3.7, the potential hazards associated with damage to gas pipelines are jet fires and blast waves. For example, if gas was to leak from the pipeline into the enclosed structure of the utility bridge north of Eastern Avenue, a flammable mixture could be produced which could explode if exposed to an ignition source. The frequencies of these events at Ataratiri have not been quantified but they are highly unlikely and represent worst case events (Concord, 1991).

7.5 Ataratiri Populations at Risk

Estimates of the population living within various distances from the rail lines and roads were derived from information provided by the City Housing Department and could change as the development plan for Ataratiri is finalized.

For any given point along a transportation corridor, the potentially affected population was assumed to include all residents within a distance of 3 km. This distance was chosen to adequately assess the potential effects of a chlorine spill (an event capable of affecting relatively distant populations). To estimate the population in each sector, the population of Ataratiri was assumed to be evenly distributed across the development. It was further assumed that the population within Ataratiri varies according to the time of day. The daytime population is the number of people employed on-site plus 46% of the full-time residents. Risks imposed by transportation corridors on residents outside of Ataratiri were not taken into account.

7.6 Estimates of Road Transportation Risks

7.6.1 Information Base

The annual movements of hazardous materials on the roadways of interest are shown on Table 7.3. These data are similar to movement data from other urban areas. Accident rates for gasoline, propane, and oleum (a corrosive) on each of the eight routes noted in Section 7.4.1 were developed from the collision frequency data for each route and adjusted to take into account route length and the amount of each hazardous material that is transported.

7.6.2 Individual Risks from Road Transportation

The estimated risks posed by road transportation to future residents of Ataratiri are summarized in Table 7.4. The risks are presented in terms of setback distances away from each road where specified individual risk levels occur. The differences between roadways are caused by many factors including the nature and volume of materials moving on the road and the accident frequency. The nature of the existing road transportation information made it necessary to make several conservative assumptions that likely overestimate actual risks (probably by an order of magnitude).

The setback distances shown in Table 7.4 for the one-in-a-million risk level are considerably smaller (at approximately 30m and 45m) for Front Street and the Don Valley Parkway than on the other routes (where the distance ranges from 159 to greater than 235

Table 7.3

ANNUAL MOVEMENTS OF HAZARDOUS MATERIALS

Street	Hazardous Materials	Equivalent Annual Movement
Bayview Avenue	LPG	1,800
Cherry Street	Gasoline	9,321
	Corrosive	3,453
Don Valley Parkway	Oxygen	1,800
	Gasoline	119,498
Eastern Avenue	Gasoline	11,925
	LPG	1,929
Eastern Avenue Diversion	Gasoline	23,850
	LPG	3,858
Front Street	Oxygen	1,800
	Gasoline	5,464
Gardiner Expressway	Oxygen	1,800
	Gasoline	128,731
	LPG	9,129
Lakeshore Blvd.	Oxygen	1,800
	Fish Meal	3,600
	Gasoline	48,000
	LPG	3,600
	Corrosive	5,400
Parliament Street	No Observed Movements	

Notes:

LPG - liquefied propane gas

Table 7.4

DISTANCES TO SPECIFIED INDIVIDUAL RISK LEVELS FOR ROAD EXPOSURE

Road Segment	Distance (m) to Individual Risk Level (chances of death in a million per year)		
	100	10	1
Bayview Avenue	15	147	>235
Cherry Street	28	114	159
Don Valley Parkway (estimated)	45	>45	>45
Eastern Avenue	<10	50	175
Eastern Avenue Div.	0	0	0
Front (Bayview to Parliament)	<10	27	>30
Front (Parliament to Jarvis)	15	30	>30
Gardiner Expressway	29	147	>235
Lakeshore Boulevard	19	127	>236

Notes:

* These risk estimates are considered to be much higher (by an order of magnitude or more) than normally expected from such an analysis due to the limited data on road traffic of dangerous goods in the area of study.

Table 7.5

COMPARISON OF SOCIETAL RISK ESTIMATES FOR ROAD SEGMENTS

Source of Risk	Segment Length (km)	Societal Risk Rate (fatalities/yr.km)	Total Societal Risk (fatalities/year)
Bayview Avenue	0.45	0.18	0.078
Cherry Street	0.52	1.10	0.57
Don Valley Parkway	0.92	0	0
Eastern Avenue	0.32	0.135	0.044
Eastern Avenue Div.	0.47	0	0
Front Street* (Parliament to Jarvis)	0.85	0.34	0.3
Front Street (Bayview to Parliament)	0.96	0.19	0.19
Gardiner:			
Segment 1	0.39	0.0056	0.0022
Segment 2	0.35	0.0072	0.0025
Segment 3	0.48	0	0
Lakeshore Blvd.:			
Segment 1**	0.39	0.0042	0.0016
Segment 2	0.35	0.0052	0.0018
Segment 3	0.48	0	0
Totals	6.08	0.146	0.89

Notes:

* This section of Front Street is not included in the totals for the road network. It is included for comparative purposes.

** These road segments were developed on the basis of population density.

m). The shorter setback distances are due to the lack of propane transported on these roads during a 1989 survey.

7.6.3 Societal Risks from Road Transportation

Societal risk estimates for the eight road sections evaluated are shown in Table 7.5. The overall societal risk is estimated to be 0.89 statistical fatalities per year. The major contributors to the risk are Cherry Street and Front Street (between Bayview and Parliament). Because residents usually live on local streets, arterial roads and expressways often are relatively small contributors to transportation risks. With the exception of Cherry Street, the risks posed to residents of Ataratiri by the road transport of hazardous materials were less than the calculated risks to the residents in the St. Lawrence community nearby.

The societal risks for some routes (or sections of routes) are estimated to be zero. This result is due either to the reported absence of truck accidents on some routes (based on a three-year data set provided by the City) or the absence of hazardous materials movements observed during the field survey in 1989. (This latter factor is the cause of the somewhat surprising result for the Don Valley Parkway: 0 Fatalities/Year.)

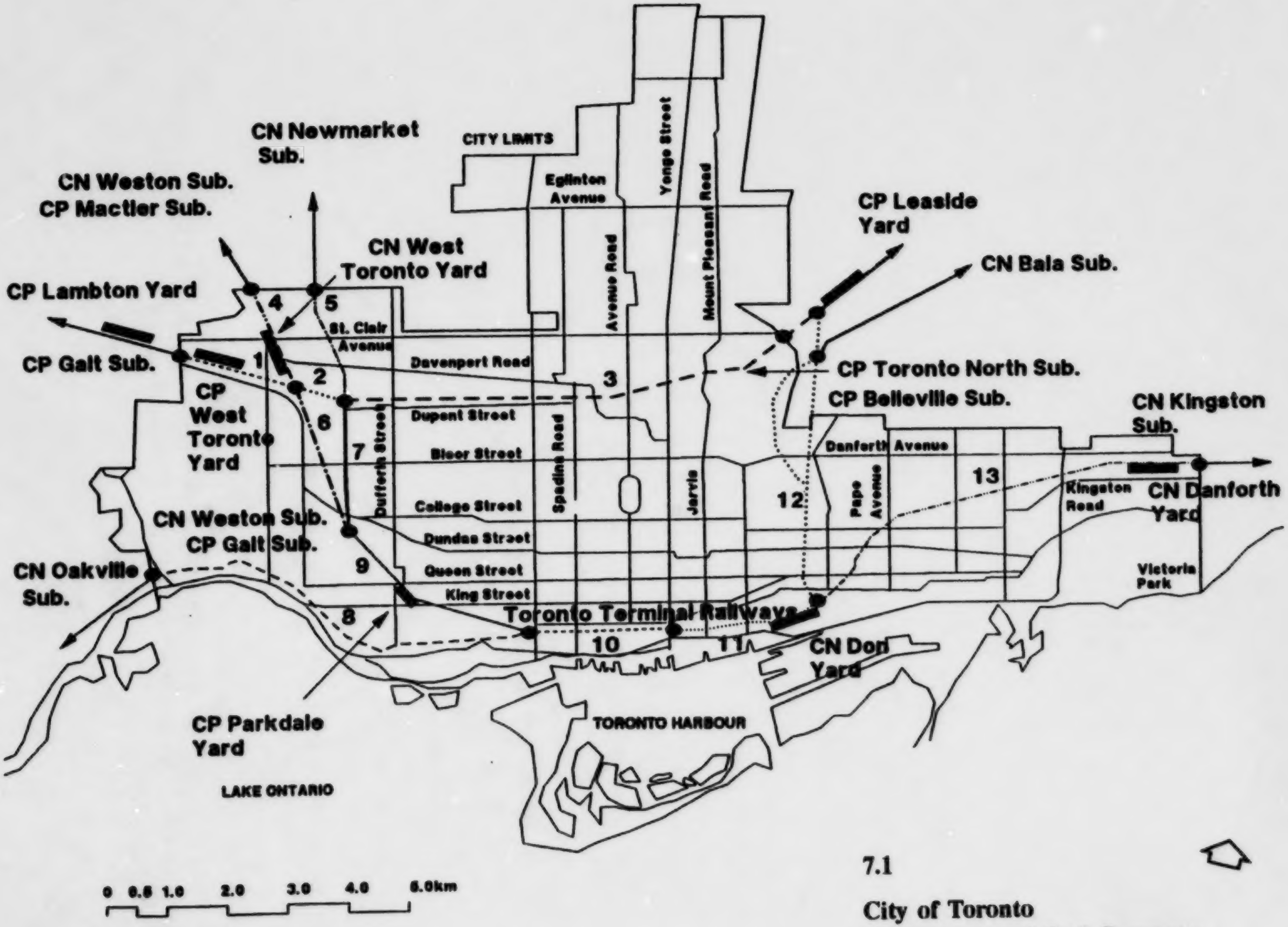
7.6.4 Sensitivity Tests for Road Transportation Risks

To examine the sensitivity of the predicted risks to the types of hazardous materials being transported along road routes, movements of gasoline and propane were examined on Cherry Street, because it is a major route for these commodities from the port area into the city; the Gardiner Expressway, because it has the highest traffic flows in the area; and the Don Valley Parkway, because it is assumed to be used for transporting dangerous commodities (despite observations to the contrary during the 1989 field survey).

In terms of individual risks, the sensitivity tests show:

- the new commodity mix generates setback distances for the Don Valley Parkway comparable to those for the other road segments;
- the setback distances along Cherry Street increase if propane is added to the commodity mix; and,
- the distances to risk levels for the Gardiner Expressway are not altered significantly.

The sensitivity tests also show that societal risks increase substantially if propane is introduced to the commodity mix transported on Cherry Street and the Don Valley Parkway. Propane introduces the possibility of hazards which can be felt over large distances.


CN Newmarket Sub.
CN Weston Sub.
CP Mactier Sub.
CN West Toronto Yard
CP Lambton Yard
CP Galt Sub.
CP West Toronto Yard
CN Weston Sub.
CP Galt Sub.
CN Oakville Sub.
CP Parkdale Yard
LAKE ONTARIO
CITY LIMITS
Eglinton Avenue
Avenue Road
Yonge Street
Mount Pleasant Road
St. Clair Avenue
Davenport Road
Dupont Street
Bloor Street
College Street
Dundas Street
Queen Street
King Street
Dufferin Street
Spadina Road
Jarvis
Danforth Avenue
Pape Avenue
Kingston Road
Victoria Park
CP Leaside Yard
CN Bala Sub.
CP Toronto North Sub.
CP Belleville Sub.
CN Kingston Sub.
CN Danforth Yard
Toronto Terminal Railways
CN Don Yard
TORONTO HARBOUR
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0 0.5 1.0 2.0 3.0 4.0 5.0km

7.1

City of Toronto
Study Area and Rail Segments

ATARATIRI
Environmental Evaluation Study Report

7.7 Estimates of Rail Transportation Risks

7.7.1 Information Base

The two rail corridors adjacent to Ataratiri are shown on Figure 7.1. The east-west track (also referred to as Segment 11) is located to the south of the site. The north-south track (also referred to as Segment 12) is located to the east of Ataratiri. Information was gathered for both tracks on the total dangerous goods traffic.

7.7.2 Individual Risks from Rail Transportation

Computed setback distances to two levels of individual risk are shown on Table 7.6. Beyond 30 m from all rail lines, levels of individual risk are estimated to be below 10 in one million per year. The differences between the two tracks can be attributed to:

- the types and volumes of hazardous materials carried on each track;
- the frequencies of potential releases of hazardous materials which in turn depend on total accident frequencies and track characteristics; and
- track orientation with respect to the prevailing wind directions.

7.7.3 Societal Risks from Rail Transportation

Estimates of societal risk are shown on Table 7.6. The estimates are based on consideration of population density, length of rail corridor, and levels of individual risk. The estimated levels of societal risk rates for the both tracks are within the range of 0.0005 to 0.07 fatalities per km per year reported for all other rail segments within the City of Toronto (Concord, 1990b).

7.7.4 Sensitivity Tests for Rail Transportation Risks

Sensitivity tests were performed for both tracks to investigate the influences of population distribution within Ataratiri and variations in the traffic levels. Population distribution in Ataratiri was considered in relation to the benefits associated with the use of setbacks as a form of reducing risks.

An analysis was performed which involved the hypothetical redistribution of the total population of Ataratiri into the north and west portions of the site, away from the two tracks. The total population was not changed, it was just concentrated into smaller areas with higher populations.

The northern redistribution would significantly reduce the societal risk from the east-west

Table 7.6

INDIVIDUAL AND SOCIETAL RISK ESTIMATES FOR RAIL EXPOSURE

Rail Segment	Distance (m) to Individual, Annual Risk Levels 10 chances in a million	1 chance in a million
East-West Track	<10	80
North-South Track	30	90

	Societal Risk Rate (fatalities/km.year)	Total Societal Risk (fatalities/year)
East-West Track	0.017	0.039
North-South Track	0.019	0.011

track while the societal risk due to the north-south track would increase because of higher density population along that track. The western redistribution would reduce the societal risks from both tracks.

The overall effect of either of these choices is to reduce significantly the societal risk from the rail tracks. The western alternative would appear to be the most effective in reducing the risk.

Increasing traffic flows while keeping the commodity mix constant increases the setback distances. (The reverse is true for decreasing the traffic flows.) The effect on societal risk is directly proportional to changes in traffic level. A 50% increase in traffic level leads to a 50% increase in societal risk.

7.7.5 The Don Sorting Yards

Information regarding the future of the Don Sorting Yards immediately south of Ataratiri suggests that activities in the northern part of the yard will be shifted to the southern part of the yards. Moving yard activities away from Ataratiri will reduce the risks; however, more information about the shift is needed before the risk reduction can be quantified.

7.8 Estimates of Marine Terminal Risks

Estimating either individual or societal risks requires many types of statistical data, some of which were not available for the marine port facilities in a form that could be used to develop statistical risk estimates. Therefore an attempt was made to develop a severe but credible accident scenario for the port area. Only those activities that occur on the water were considered; the on-land storage facilities used for the goods transported into and out of the port area are discussed in Section 7.9.

The Toronto Harbour Commissioners provided information on the types of materials handled by vessels using the port facilities. Cargo records were reviewed to determine that annual quantities of hazardous materials being handled include:

- caustic potash flake (20,000 kg);
- microcrystalline zirconium oxide (200,000 kg);
- polypropylene (quantity not available);
- zinc (200,000 kg);
- petroleum sulphonate (300,000 to 400,000 kg); and
- gasoline (81,000,000 L).

Among these six materials, gasoline is of greatest concern. All shipments of gasoline are made through the Ship Channel, and an evaluation of a fire resulting from an upset during shipping operations was undertaken. While there is a possibility of air pollution occurring during such an incident, the effects of air pollution were not considered. Only the thermal radiation resulting from a pool fire was examined using a mathematical model.

Ataratiri is more than 1100 m from the Ship Channel at its closest point. The results generated by the model indicate that no direct effect on the population of Ataratiri would occur from such an incident.

7.9 Estimated Fixed Facility Risks

Thirty-four fixed facilities have been identified in the vicinity of Ataratiri that store and handle hazardous materials that represent either an inhalation hazard if released to the air, or a thermal or explosion hazard if ignited. To illustrate the fire and toxic indices noted in Section 7.4.3, the indices were calculated for three facilities. The results indicate that the Gooderham & Worts distillery has the highest index of the three facilities considered. Distilling operations ceased in 1990 and the site is being considered for redevelopment, primarily for residential and commercial purposes. It is expected, therefore, that risks from the storage and handling of hazardous materials at the distillery will be eliminated.

Fire Department records from 1981 to 1989 show that it was called to 48 incidents which involved fire or spills of dangerous goods at fixed facilities. The available information is insufficient to undertake a quantitative assessment of the hazards or risks from fixed facility risks; however, it is possible to put the likely risks from these facilities into perspective on qualitative grounds. The hazardous materials handled, or stored, at the fixed facilities must be transported to and from these facilities by road, rail or ship. Since road and rail routes currently run through and/or along side Ataratiri, it is unlikely that off-site, fixed facilities pose similar or greater acute risks than those posed by the transportation corridors.

As noted in Section 7.4.4, the natural gas pipelines carried by the bridges that cross the Don River just east of Ataratiri could pose hazards due to explosion and jet fire. The probabilities of such events occurring would not be significantly different than those for natural gas pipelines operating under similar conditions.

7.10 Remedial Options and Strategies for Transportation and Fixed Facilities Risks

7.10.1 Basic Approaches to Managing Risks

Basic approaches to managing risks include: reducing the amount of hazardous material used; using materials that are less hazardous; increasing the distance between hazardous materials and the people at risk; and, reducing the accident rate of handling hazardous materials.

Examples of methods that can be used to reduce risks include "internal" options that can be deliberately incorporated into Ataratiri such as buffer zones, building locations, and transportation alignments. Some of the "external" options such as lower speed limits, better operator training, alarm systems, emergency plans, and improved vehicle inspection can be used by society as a whole, but are beyond the influence of specific developments (including Ataratiri) to institute.

7.10.2 Managing Road Transportation Risks

For an individual risk level of 1 in 100,000, the setback distances for various road sections in Ataratiri are estimated to range between 30 and 147 m. Along the eastern boundary of Ataratiri, the combined effect of Bayview Avenue, the Don Valley Parkway, and the rail lines, increase setback distances.

The use of setback distances from the roads may be a means of reducing risk but it is not considered as effective as removing the source of the risk. A more effective means of reducing the risks from road transportation may be to limit the transportation of hazardous materials to certain routes. A review of the data for individual road sections in Ataratiri suggests that restrictions on the transportation of dangerous goods should be considered for Front Street East, and all hazardous materials should be eliminated from Cherry Street.

Another risk management option would be to prohibit truck traffic on roads local to and through Ataratiri during night-time hours. This would reduce the exposure levels by taking advantage of improved day-time dispersion conditions, lower day-time populations, and the ability of the population to react during working hours.

7.10.3 Managing Rail Transportation Risks

The data in Table 7.6 define the areas of the site that should be excluded from residential use based upon exposure to rail-related risks, if the acceptable risk level is set at approximately 1 in 100,000. Such areas could be used as open space or for light industrial purposes. The largest exclusion area would be in the southeast corner of the site.

This evaluation is based upon the current knowledge of the traffic patterns, commodity mixes, and the accident environment of the rail lines. It is also possible to reduce the risks by taking steps to reduce the frequency or severity of the accidents on the rail lines, but such measures can not be implemented unilaterally by the City of Toronto.

The redevelopment of the Ataratiri area offers an opportunity to improve, from a risk point of view, the infrastructure around the rail lines at minimal additional cost. These improvements could include making more water available along the rail lines and constructing drainage controls to limit the extent of spills. Barriers are another measure that could reduce risk, but they can provide a mixed benefit. While they do reduce exposures they also impair site access for emergency response workers. If barriers were to be built, they likely would be most effective at the southeast corner of the site.

7.10.4 Managing Marine Terminal Risks

The main marine risks result from the handling of flammable materials; however, fires are expected to have a minimal impact on Ataratiri. Emergency preparedness plans and regular inspections of the fire-fighting capabilities of the facilities around the port lands would reduce the risk of wide-scale involvement in the fire and thus the risk to Ataratiri. Such preventative measures would also reduce the potential damage to facilities in the port.

Shippers of hazardous materials through the port, should be required to document their movements and inform the Toronto Harbour Commissioners. This would allow accident response plans to be developed.

7.10.5 Managing Fixed Facility Risks

Risks from fixed facilities have not been quantified in this study. Rather, the study has identified the types of hazards that may be present in the various facilities that could be a source of risk to Ataratiri.

During the tour of the Ataratiri area, various rail cars and tanks storing flammable and toxic materials were found in areas where they might become involved in collision-type accidents and subsequently release hazardous materials. It is recommended that steps be taken to ensure that these tanks are protected from collisions. This should not be interpreted to mean that certain equipment, processes, or materials not be allowed within a specified distance of Ataratiri, but rather that guidelines and inspection procedures should be instituted to minimize the potential for accidents. It is also necessary to develop adequate emergency response measures to deal with the accidents that may occur.

Numerous buried pipelines are known or suspected to cross Ataratiri. The City has started to contact pipeline owners, operators, and utilities to determine pipeline locations and status. Pipelines no longer needed likely will either be removed or properly purged of their contents and abandoned.

Several measures can be taken to manage the risks posed by the natural gas pipelines carried by the bridges that cross the Don River just east of Ataratiri. These include installing emergency shut-down valves along the pipeline; venting the top of the bridge enclosure; installing a weak section in the roof of the enclosure that would direct explosive forces upward; and regularly inspecting the pipeline for corrosion. Some of these measures may already be in place.

7.11 Recommendations for Further Studies

Various studies are needed either to improve the confidence and/or the accuracy of the risks assessments of transportation and fixed facilities in and around Ataratiri or to assess the possible effectiveness of risk reduction proposals:

- Reliable annual traffic estimates and data on dangerous goods movements by truck are required to improve estimates of road traffic risks;

- Alternative routing should be examined as a means of reducing the risks from road transportation of hazardous materials. It would be necessary to ensure that alternative routes do not produce unacceptable risks for neighbouring communities. An origin and destination study of trucks carrying dangerous goods in the immediate vicinity of Ataratiri would provide a basis for examining alternative routes. For that traffic which cannot be rerouted, options should be examined such as restrictions on trucks carrying dangerous goods during night-time hours; and,

- The location of the underground pipelines in the development area should be established and the risks assessed. This is particularly important for construction activities and for emergency response planning. The location of valve stations should be determined.

8.0 PUBLIC PARTICIPATION PROCESS

8.1 Public Participation Requirements

The Exemption Order for Ataratiri sets out four requirements related to public participation in the environmental planning and review process for Ataratiri:

1. "An opportunity for public notice, review and comment" of the EES report before it is submitted to the MOE for approval.

2. Inclusion in the final EES report of "a summary of any submissions made or concerns raised by the public and the responses thereto."

3. "A meeting at which the public may make representations to City Council or one of its committees" on detailed studies that deal with the extent of environmental problems and suggested remedial measures that will be carried out for each part of the site before they are submitted to the Director of Central Region, MOE for approval.

4. Encouragement and provision of "full public participation in the planning process."

In accordance with the terms of the Exemption Order, a public participation program on the environmental aspects of Ataratiri was developed. The details of this program are discussed in the following sections. Public participation opportunities concerning non-environmental aspects of the Ataratiri project are not discussed in this report. A description of public participation that is being carried out as part of the Part II Official Plan Proposals report process and the floodplain planning process can be found in the *Ataratiri: Principles, Directions and Strategies* report (Commissioners of Planning and Development and Housing, 1990).

8.2 Public Participation Program Prior to the Release of the Draft EES Report

8.2.1 Overview

This aspect of the Ataratiri public participation program for environmental concerns has three components. The first was an opportunity for members of a citizens advisory council to have direct involvement with the EES throughout its development. The second component consisted of periodic opportunities for the public-at-large to become aware of, and comment on the environmental studies that were being carried out at Ataratiri. The third component was information dissemination.

8.2.2 Neighbourhood Advisory Council

One of the first acts of City Council after the announcement of Ataratiri was to establish a Neighbourhood Advisory Council (NAC) specifically for Ataratiri to work closely with City staff and provide input into the Ataratiri planning process. NAC is composed of 19 volunteers who represent a broad range of interest groups including housing producers, elected local and regional officials, environmental and community health interests, local businesses, industries and residents, and community service providers (see list of members in Table 8.1).

The need to establish NAC was based on experience with citizen participation gained in planning the St. Lawrence Neighbourhood. That experience demonstrated the need to incorporate community views, allowing citizens to review all studies before being submitted to Council, and ensuring that the project plan supports the agreed-upon objectives for the new neighbourhood. It also led Council to select the specific NAC positions listed above. Individuals were chosen to fill the positions based on consultation with local elected representatives, contact with groups that had made deputations on the subject to the Neighbourhoods Committee, and contact with other groups active in the designated categories.

NAC members were expected to ensure that their respective constituencies were kept informed of the work in progress and that views from their constituencies were represented at NAC meetings. The primary responsibility of NAC was to provide advice to staff and City Council on planning the development and to ensure public participation in the environmental evaluation study process. To meet this responsibility, NAC was expected to meet on a regular basis (monthly, or as necessary) to comment on: environmental issues; general neighbourhood issues; provision of community support services; built form, particularly as it relates to family housing; accessibility; park design, location and use; retail shops and services; links to other neighbourhoods; and the provision of employment opportunities. A commitment was made by the members to devote the time required and to go back to their respective constituencies and disseminate information on the project.

Council was highly supportive of NAC as indicated by their early request for staff to increase NAC's role in the work program. NAC itself was asked to determine its relationship with staff, meeting frequency, chairperson, issues it would deal with, and how public input was to be incorporated.

As can be seen in the above description of the expectations for NAC, several issues were involved that do not bear directly on the EES. Those issues are discussed in the *Ataratiri: Principles, Directions and Strategies* report (Commissioners of Planning and Development

Table 8.1

MEMBERSHIP IN THE NEIGHBOURHOOD ADVISORY COUNCIL
(August 1991)

Name	Representation
Bud Binney	St. Lawrence Business Association
Niall Byrne[1]	Community health interests
Wayne Canning[2]	Local industrial interests
Dino Chiesa	Private housing sector
Pamela Cluff	Seniors and people with disabilities
Corky Cramer	Corktown Business Association
Father Tom Day	Separate School Board
Elizabeth Greaves[3]	Social Service interests
Barbara Hall	City Councillor, Ward
Roger Hollander	Metro Councillor, Don River
Pam McConnell	Toronto Board of Education
David Monk[4]	St. Lawrence Residents' Association
Peter Oliphant	Cityhome
Linda Peake[5]	Urban quality of life interests
Chris Smith	Co-operative housing producers
Mark Stevenson[6]	Environmental interests
Barbara Thornber	Community non-profit housing producers
Sassy Waddell	Corktown Residents' Association
Rev. Paul Webb[7]	Community economic development interests

Notes:

1. Temporarily replaced by John Browne, Summer 1990-1991.
2. Formerly represented by Dan McLean.
3. Formerly represented by Elspeth Heyworth and Lin Grist.
4. Formerly represented by David Gunter.
5. Formerly represented by Frances Frisken.
6. Formerly represented by Harry Dahme.
7. Formerly represented by Jacques Tremblay.

and Housing, 1990) and the *Ataratiri: Part II Official Plan Proposals* report (1991).

NAC has met monthly, and established seven subcommittees:

- Communications;
- Community Services/Social Structure;
- Economic Development;
- Environment;
- Finance/Development;
- Land Use/Physical Planning; and
- Gooderham & Worts.

All monthly NAC meetings were open to the public from November 1988 through January 1990. At that time, an adjustment was made to allow for greater interaction with the public. On alternate months, beginning with February 1990, NAC met in closed session to conduct its business. On alternate months, beginning with March 1990, the meetings were open to the public. These bi-monthly meetings became monthly meetings between July 1990 and February 1991. The primary agenda at each meeting was the presentation of the results of studies or work-in-progress. Public input including suggestions, questions and comments were invited at these meetings.

Three members of NAC sat on the NAC Environmental Subcommittee during 1988, 1989, and 1990. A fourth member joined in 1991. The Subcommittee's main goal is to ensure that Ataratiri becomes and remains a safe and healthy neighbourhood. Subcommittee members helped prepare terms of reference for and reviewed all studies that were carried out as part of the EES process. They also provided feedback to staff on environmental, public health and safety issues as they relate to the proposed development.

Between November 1988 and March 1991, NAC sponsored a number of public forums and meetings. Those meetings that were held to discuss environmental issues are described below. The first meeting dealt with the environmental process. The subsequent meetings dealt with the individual environmental studies that were being carried out as part of the EES. These meetings occurred before the final draft reports were completed to allow public concerns to be incorporated. Transcripts and/or minutes of the meetings described below are on file in the public document centres described in Section 8.2.4.

8.2.3 Public Meetings

a) Environmental Evaluation Study Process

On 1 June 1989, NAC held a public meeting at the Castle Frank High School Auditorium.

The objectives of the meeting were:

- to discuss the Environmental Evaluation Study process and the issues that were emerging at that time;
- to introduce the consultants that would be carrying out environmental studies and allow them to hear public concerns; and
- to allow the public to express their concerns.

Paid advertisements of this meeting were placed for two days each in *The Globe and Mail*, *The Toronto Star*, and two community papers in the immediate neighbourhood. Approximately 50 people attended. An MOE representative was present.

After opening comments by City staff and members of the NAC Environmental Subcommittee, a presentation was made by SENES Consultants Limited that briefly described the degree of environmental contamination and other problems that had been identified in studies carried out up to the spring of 1989; identified the consulting firms that were preparing each of the background studies; and discussed the investigation process and opportunities for further public involvement.

Members of the public asked questions to clarify details of the locations and degree of soil contamination in some of the areas. No written comments were received as a result of this meeting. Section 8.4 summarizes the verbal comments as recorded in the transcript of the meeting. The transcript of this meeting is on file at the public document centres described in Section 8.2.4

b) Noise and Vibration

On 24 May 1990, NAC held a public meeting at Ryerson Polytechnical Institute at which Vibron Ltd. made a presentation on the results of the noise and vibration study. Information was presented on applicable criteria, the results of on-site measurements, and proposed mitigation measures. Both noise and ground-borne vibration were discussed. The consultant used a noise meter to measure different sounds produced by those in attendance at the meeting.

c) Transportation and Fixed Facility Risks

On 17 July 1990, NAC held a public meeting at St. Paul's Church at which Concord Environmental made a presentation on the outcome of the transportation and fixed facility risk study. Information was presented on the concept of risk, how it is measured, how risk assessments are conducted, and the types of risks investigated at Ataratiri (e.g. marine operations and rail transportation of dangerous goods).

d) Air Quality

On 21 August 1990, NAC held a public meeting at St. Paul's Church at which Rowan, Williams, Davies & Irwin Inc. made a presentation on the findings of the air quality study. There were no questions from the public regarding this presentation.

e) Soil and Ground Water Management

On 18 September 1990, NAC held a public meeting at St. Paul's Church at which Trow, Dames & Moore presented the results of soil and ground water investigations that have been undertaken at the site. At this meeting the following material was provided to the public: *Ataratiri: Soil and Groundwater Quality Summary*; *Soil Guidelines Summary*; *PAHs: Questions and Answers*; and *Metals: Questions and Answers*. Information on public input at this meeting can be found in Section 8.4.

f) Health Risk

At the same meeting on 18 September 1990, CanTox Inc. described the methods which have been used to develop the soil cleanup guidelines that have identified for use at Ataratiri and the methods that will be used to conduct a health risk assessment. Information on public input at this meeting can be found in Section 8.4.

g) Flood Risk

On 23 October 1990, NAC held a public meeting at St. Paul's Church at which Marshall, Macklin, Monaghan made a presentation on the results of the flood protection options study. Information was presented on the required approval process, projected extent of flooding, and various flood protection measures. Information on public input at this meeting can be found in Section 8.4.

h) Storm Water Management

On 15 January 1991, NAC held a public meeting at St. Paul's Church at which Marshall, Macklin, Monaghan made a presentation on the results of the storm water management study. Information was presented on pollutant removal efficiency and other matters related to various storm water management options. Information on public input at this meeting can be found in Section 8.4.

i) Soil Remediation Options

At the same meeting on 15 January 1991, Trow, Dames & Moore described the soil remediation options that could be used at the site. The following three types of soil remediation options were discussed: off-site disposal, on-site or off-site treatment, and on-site management. A method of evaluating these options in terms of technological suitability and risk evaluation was presented. In addition, the public was provided with the following written material: *Soil Remediation Options Being Examined for Ataratiri* and *Proposed Approach for Examining Soil Remediation Options*. Information on public input at this meeting can be found in Section 8.4.

j) Green Development

On 19 February 1991, NAC held a public meeting at St. Paul's Church at which suggestions and comments from the public were received on green development ideas for Ataratiri. A questionnaire and handout on ways to make this neighbourhood an environmentally friendly community were distributed and discussed. Information on public input is presented in Section 8.4.

k) Soil Remediation Workshop

On 19 March 1991, NAC held four concurrent public workshops at St. Paul's Church, one of which addressed soil remediation options. The purpose of the workshop was to explore the public's views on the types of remediation options being considered for Ataratiri. Consultants and staff were present to facilitate the workshop discussion and provide technical input when required. Various handouts were distributed. A summary of the public input is presented in Section 8.4.

8.2.4 Publicly Available Written Materials

To ensure public access to information relating to Ataratiri, document centres were established at the following locations:

- Library of the Royal Commission on the Future of the Toronto Waterfront, 207 Queens Quay West;
- Municipal Reference Library, City Hall Branch;
- Ryerson Library, Urban Regional Planning Room, 350 Victoria Street;
- St. Lawrence Neighbourhood Public Library, 171 Front Street East;
- University of Toronto School of Architecture Library, 230 College Street;
- York University Government Documents/Administrative Studies Library, 4700 Keele Street;
- City of Toronto Planning and Development Department Library, City Hall; and
- Ministry of the Environment, Environmental Assessment Branch, 250 Davisville Avenue.

The types of information sent to these document centres include: staff reports such as

Ataratiri business plans, annual reports to the Director, Central Region of the MOE and the *Ataratiri: Principles, Directions and Strategies* report; minutes of NAC meetings; minutes and transcripts from public meetings; NAC newsletters; and the background environmental reports.

The Ataratiri Newsletter is a publication that presents information of public interest. The first issue, distributed in the spring of 1989, introduced the project and concept, NAC, and the process being followed. It also included an invitation to the 1 June 1989 meeting.

The second Newsletter, distributed in the summer of 1989, highlighted the selection of the name Ataratiri and presented information on four of NAC's subcommittees, including the Environmental Subcommittee. The Environmental Subcommittee's report identified the various environmental investigations being undertaken, the consultants responsible for each, and their mandates.

A third Newsletter, distributed in December 1990, included two items relevant to the EES. One described the status of the EES report. The other was a report from the chair of the Neighbourhood Advisory Committee commenting on the enthusiastic response from the public and urging them to get involved in the public review of the EES report which was expected to be available in early 1991.

The Newsletters were filed in the document centres and distributed to a mailing list, placed in various public locations for pick up, and hand-delivered (approximately 5,200 copies) to homes in the vicinity of Ataratiri. The mailing list grew from about 125 in January 1989 to 1,100 in February 1991.

To assist and encourage public involvement in the process, a contact name and telephone number was provided on each Newsletter and in other public notices. Almost all of the feedback from the Newsletters and from other announcements were queries related to how people could get on a potential tenants list.

8.2.5 Informal Public Participation Opportunities

A number of other opportunities were provided for the public to comment on, or ask questions about, environmental concerns at Ataratiri prior to the release of the EES report. The major ones are summarized here.

The Toronto Public Library maintains an office building within the Ataratiri boundaries. Staff of this Board became concerned about possible coal tar contamination at that location when they became aware that similar contamination had been identified nearby. On 13 July 1989, Ataratiri staff, along with representatives from Trow, Dames & Moore and SENES Consultants Limited, met with Toronto Public Library staff to discuss their concerns.

In September 1989, the Task Force to Bring Back the Don was established. Its members include interested members of the public and city, provincial, and federal politicians. Ataratiri staff has met with the Task Force on an ongoing basis since December 1989 to represent or discuss Ataratiri and its relationship to the Don River. A summary of these discussions can be found in Section 8.4.

Members of NAC have made two appearances at hearings held by the Royal Commission on the Future of the Toronto Waterfront. A summary of these appearances is presented in Section 8.4.

Opportunities for public input and information dissemination on environmental issues have also occurred on an ongoing informal basis through direct contact with staff. These opportunities have included information sessions with students from a number of high schools, the University of Toronto, Ryerson Polytechnical Institute and York University, and presentations to professional associations and at conferences.

8.3 Public Review of the Draft EES Report

8.3.1 Review Opportunities

The primary opportunities for public review of, and comment on, the draft EES report will occur during a 30-day period after the release of the draft report and a later 15-day public review and comment period on the "Responses to Public Comment on Draft EES" and on any resulting revisions to the EES report. The availability of the report and public review opportunities will be announced by newspaper advertisements in the daily newspapers and local community newspapers and a press release when the draft report is released. These announcements will include:

- dates, times and locations of open houses and a public meeting that will be held during the comment period;
- the location where the document can be picked up by members of the public;
- the closing date for receipt of public comments; and
- a contact name and telephone number.

At about the same time, a Newsletter will be prepared and distributed to the mailing list, approximately 5,200 households, and other interested parties. This flyer will describe the contents of the EES report, describe the importance of public review, and provide information on how and when public comments can be made.

Two open houses will take place during the 30-day public comment period. They will provide informal opportunities for the public to discuss the draft EES report with staff and consultants and to examine maps and other information materials.

The public meeting will represent a formal opportunity for the public to provide their comments and recommendations. The public meeting will be scheduled to occur a few days before the end of the comment period to allow the public time to comment on any new information or ideas they might receive at the public meeting.

After the initial set of public comments has been reviewed, responses to these comments will be prepared and, if necessary, the EES report will be revised. These responses and revisions will be made available to the public for their review and possible further comment during a second 15-day comment period. Notification of this second comment period will be made by newspaper advertisement as well as by individual notification to those who submitted initial comments.

8.3.2 Funding for Public Review of the Draft EES Report

As approved by the Toronto City Council, funding in the amount of $100,000 has been made available to interested nonprofit community and environmental groups and organizations that want to review the draft EES report. A special five-person subcommittee was established to review funding requests in terms of the following criteria established by Toronto City Council:

- The applicant must represent a clearly ascertainable community interest and independent representation of that interest will make a useful and substantial contribution to the review of the EES report.
- The applicant would apply the funds received in a manner which would contribute substantially to the understanding of issues related to the EES report.
- The applicant should have an established record of concern and a demonstrated commitment to its specific concern.
- The applicant should have a clear proposal for the use of any funds which might be awarded.

Funding applicants also were asked to describe how the funding will be used, why this work is important and a projected budget.

Funds were awarded to two groups: Metropolitan Toronto Waterfront Coalition and Dixon Hall. The Waterfront Coalition, a federation of 22 neighbourhood associations and environmental groups with a special interest in waterfront issues, received $53,300 for a technical review of the background environmental reports that support the EES report. Groups joining the Coalition were Citizens for a Safe Environment, Metropolitan Toronto Residents Action Committee, South Riverdale Community Health Centre, Toronto Environmental Alliance, and Toronto Field Naturalists.

Dixon Hall, a neighbourhood social and family service centre in the vicinity of Ataratiri, received $21,652 to create summaries of the EES report and obtain opinions about the report from a cross-section of people in the neighbourhood who will be directly affected by the new community (e.g., local businesses, homeless, homeowners, tenants, senior citizens, and teenagers).

Public announcements of this funding opportunity were made by press release and paid advertisements in *The Toronto Star*, *The Globe and Mail*, *Sing Tao*, *Now Magazine* and *The Midtown Voice* in late January and early February 1991. A deadline of 14 March 1991 was set for receiving funding applications.

8.4 Public Input

8.4.1 Public Input Prior to the Release of the Draft EES Report

a) Neighbourhood Advisory Council

The first major item of public input was a set of environmental goals developed by the Environmental Subcommittee of NAC. These goals are shown in Table 8.2. Many of the points addressed in these goals were repeated at other times by members of the public and NAC. They appear to represent the overall thrust of public opinion as to the environmental issues that should be addressed in the EES report and the planning process, how they should be addressed, and what the public expects as a suitable level of environmental quality.

As the results of the background environmental studies became available, extensive discussions of these materials took place among the members of the Environmental Subcommittee, Ataratiri staff and the relevant consultants. The draft Noise and Vibration report was discussed on 12 October 1989; the draft Air Quality report was discussed on 24 January 1990; the draft Flood Protection report was discussed on 13 February 1990; the draft Soil and Ground Water Management reports were discussed on 5 June 1990; the draft Transportation and Fixed Facility Risk report was discussed on 10 October 1990 and the draft Health Risk Issues report was discussed on 30 January 1991. Details of these discussions can be found in the minutes of the Environmental Subcommittee.

Table 8.2

ENVIRONMENTAL GOALS DEVELOPED BY THE ENVIRONMENTAL SUBCOMMITTEE OF THE NEIGHBOURHOOD ADVISORY COUNCIL

1. To ensure that the site becomes and remains a safe and healthy place to live and work.

2. To evaluate existing environmental conditions at the site including any human health concerns, soil quality, surface and ground water quality, air quality (including dust and odours), and noise and vibration, and to evaluate the risk of flooding from the Don River and the risk of accidents on major road and rail corridors.

3. To make soil quality at the site safe for the intended land use and ensure that contaminated soils are disposed of appropriately.

4. To ensure that remediation of existing soil and ground water does not result in adverse human health or environmental impacts on or off the site.

5. To ensure that air quality at the site does not adversely affect the health of residents of the new community.

6. To ensure that measures are taken to protect occupants from unacceptable levels of dust, odours, and noise and vibration.

7. To ensure that residents of the new community are not subject to unacceptable levels of risk from flooding in the Don River or from accidents on road or rail corridors.

8. To document the environmental remediation process for the development so that future residents can verify that appropriate steps were taken to remediate any human health and safety concerns at the site.

9. To implement a planning and development strategy that is consistent with the goal of restoring the Don River to a more natural state.

10. To incorporate state-of-the-art waste reduction and recyclable material recovery systems into site planning and building design.

11. Where hard services (e.g., sewers) are to be replaced, to replace them with the most environmentally sound alternatives.

b) Public Meetings

The 1 June 1989 public meeting provided an opportunity for the public at large to comment on environmental issues related to Ataratiri and on the EES process. Questions were received and answers given. This interaction is documented in Appendix B. A transcript was made of the meeting.

As detailed above in Section 8.2.3 a number of public meetings on a variety of topics relevant to the Environmental Evaluation Study were held under the auspices of the Ataratiri NAC. The following provides a brief overview of the public input at each of these meetings. Questions and answers as recorded in the minutes of each of these meetings (with the exception of the August 1990 meeting at which there was no public input to the Air Quality report) can be found in Appendix B.

At the 24 May 1990 presentation on the Noise and Vibration study, most public questions and input focused on a comparison of noise levels in Ataratiri with those in Toronto neighbourhoods in general.

At the 17 July 1990 presentation on the Transportation and Fixed Facility Risk study, a variety of issues were brought up by the public with only a few of them, such as the present on-site storage of hazardous materials, pertaining even indirectly to the topic of this report.

At the 18 September 1990 presentations on Soil and Groundwater Management and on Health Risk, there was considerable public input. On the issue of soil quality, there were questions and discussion concerning the expected level of soil quality after remediation activities were completed, and on how "acceptable" soil guidelines were determined, especially for organic substances. Risks associated with removing contaminated soil were also discussed.

Questions on ground water contamination dealt with types, quantities, locations, migration possibilities, and possible exposure pathways. The public also wanted to know the location and capacity for off-site locations for disposal of hazardous waste.

The roles of consultants, public agencies and others in choosing and making final recommendations on remediation options were discussed along with questions on how remediation costs would be covered.

In the area of health risks, there were questions on cumulative exposures; on what would happen if new, more stringent guidelines were developed; and on establishing a system for on-going monitoring of the health and health-related concerns of residents. In the determination of expected risk levels, questions focused on the use of worst-case, conservative assumptions, large safety margins, post-remediation environmental quality indicators, and residential area guidelines.

At the 23 October 1990 presentation on Flood Plain, most of the public input focused on costs associated with various flood protection options.

At the 15 January 1991 presentations on Storm Water Management and Soil Remediation Options, there was a relatively small amount of public input. On the issue of Storm Water Management, public questions focused on issues related to using a storage tank with a pumping system. On the issue of Soil Remediation Options, there were only a few questions on specific points raised during the presentation. A second, more interactive public workshop session was held on 19 March 1991 to allow the public to become more familiar with the complexity of these options and to express their views.

At the 19 February 1991 meeting on green development ideas, most of the discussion focused on issues related to vehicle use, traffic flow, and energy conservation or use.

At the 19 March 1991 workshop on soil remediation options, consensus was reached that permanent solutions should be used, health concerns should be given the highest priority, and proper clean-up should take precedence over the development of new housing. Other issues discussed included the source and validity of guidelines used for specific contaminants, the risks associated with various remediation options, and the need to use proven technologies. Other conclusions reached were that problems should not be exported to other areas, equal risk levels should be used for residential and industrial land uses, and none of the proposed remediation options were deemed unacceptable. When specific clean-up proposals are developed, detailed background information on risks/certainties, advantages/disadvantages, and any other relevant matters should be vetted with the public.

c) Consultation with Other Groups

Ataratiri staff or NAC members met with the Task Force to Bring Back the Don on seven occasions between December 1989 and May 1991. Presentations and discussions at the meetings centred on Ataratiri's proposed Don River park and open space system and the way that these initiatives would complement ideas being considered by the Task Force in its attempts to improve the Don River and its valley. The major area of agreement is the shared desire that: the banks of the Don be restored to a naturalistic condition; access to the valley lands be improved; the river be treated as part of the green space system, with upstream and downstream linkages; and the proposed Don River park be part of this process of improvement. The Task Force expressed its support several times for the initiatives being proposed for Ataratiri and the positive impacts they could have on the Don River Valley. On 23 April 1991, the Task Force adopted a motion supporting the Ataratiri plan that proposes a largely natural park area adjacent to the Don River.

At its meeting on 21 May 1991, the Task Force requested staff of the Ataratiri project to review the potential impact of the Ataratiri site plan on the migratory patterns of birds. Ataratiri staff currently is working with the Task Force to fulfil this request. A preliminary response has been to reduce proposed building heights alongside the river in the vicinity of the Eastern Avenue Diversions. The effectiveness of this site plan change is being explored.

Recently the Task Force has announced its proposals for improving the Don River. These include creating a wetland area to the north and south of Ataratiri. These were first presented publicly at St. Lawrence Hall on 28 February 1991. Ataratiri staff has reviewed these proposals with members of the Task Force, and has informally expressed general support subject to the Task Force carrying out detailed flood modelling studies to show that there would be no significant adverse impact on Ataratiri over current conditions. In that regard, Ataratiri staff and its flood management consultants met with members of the Task Force on 11 April 1991 to review and discuss what methods or tests would be used to illustrate the impacts of the proposed improvements on the Regional flood level. As of August 1991, the Task Force was exploring potential sources of funding to evaluate the proposed improvements.

On 17 April 1990, Mr. Harry Dahme, then Chair of the Environmental Subcommittee of NAC made a presentation to the Royal Commission on the Future of the Toronto Waterfront outlining the role of NAC and the basic premise behind the planning approach it was taking. He indicated that eight site planning concepts had been presented to the Task Force to Bring Back the Don. Parallels were drawn between the concept of the proposed Don River park and the Commission's idea of community forests. The attention of the Commission was also drawn to the strategy for flood-proofing the site, and the fact that the proposed levels of flood-protection assumed that the Keating Channel would continue to be dredged. As the Royal Commission held Federal and Provincial mandates, the required flood protection measures, which would also protect the Port Industrial District, was in the interests of both those levels of government. A continuing commitment from the agencies funding the current dredging of the Keating Channel was requested.

On 30 May 1990, Dr. Niall Byrne, a member of the NAC Environmental Subcommittee, made a presentation to a Royal Commission hearing on Environment and Health. He addressed the various components of the EES that were being carried out. In particular, he dealt with the need for province-wide clean-up criteria for a much broader range of contaminants than those for which guidelines now exist; the need to improve water quality in the Don River to reduce or eliminate the need for special treatment/disposal of dredgate from the Keating Channel; the improvements to water quality in the lower Don that will occur as a result of Ataratiri; and the concern of NAC that the industry being proposed by the Royal Commission for the Port Industrial District not have a detrimental impact on air quality in surrounding areas including Ataratiri.

Ataratiri staff also has met with staff of the Royal Commission in December 1990 and August 1991 to discuss issues related to soil remediation and flood protection in the lower Don which affect Ataratiri, the Port Industrial District, and East Bayfront. Ataratiri staff made a presentation on the status of soil remediation plans for the Ataratiri site at a workshop sponsored by the Royal Commission on 19 June 1991.

8.4.2 After the Release of the Draft EES Report

This section will summarize all written and verbal public comments made after release of the draft EES, including comments received at the two open houses and the public meeting and written comments provided by nonprofit groups awarded funding to review the draft EES report.

This section will be completed after the comment period. It will include a summary of all comments and response to those comments. If changes are made to the draft EES report based on public comments, the locations of the changes or additions will be indicated. If changes are not made, the rationale for doing so will be provided. All written comments and responses to these comments will be included as an appendix to the EES report.

8.5 Future Public Information on the Environmental Remediation Process

As shown in Table 8.2, Goal 8 of the Environmental Subcommittee of NAC was to "document the environmental remediation process for the development so that future residents can verify that appropriate steps were taken to remediate any human health and safety concerns at the site." In support of this goal, a public file will be maintained by the City Clerk on the Ataratiri remediation process. Copies of the following documents will be kept in the file as well as being forwarded to the Central Region of the MOE for its files:

- The background studies for Ataratiri concerning air quality, noise and vibration, soil management, ground water and storm water management, transportation and fixed facilities risks, health issues associated with air, soil, and ground water quality, and flood risks.

- The EES report.

- Soil and ground water management plans for each sub-area of the site.

- Environmental inspection reports for each development block.

- Certification that the site and buildings comply with all necessary environmental safeguards.

- The results of any long term monitoring that will be undertaken.

In addition, as required by section 5c of the Ataratiri Exemption Order, prospective tenants of any residential premise owned by or controlled by the City will be advised of the nature of any ongoing environmental concerns such as potential noise, vibration, dust, or odour impacts on the premise.

9.0 ENVIRONMENTAL ISSUES AND THE SITE PLANNING PROCESS

9.1 Overview

Ataratiri represents the type of development that is becoming increasingly common in downtown areas as old and obsolete industrial sites are redeveloped. The successful redevelopment of these sites depends on the careful integration of environmental considerations in the site planning process. A key component of the planning process for Ataratiri has been the link between environmental conditions and site planning. Where possible, environmental conditions that are likely to have an adverse effect on future residents have been dealt with through physical design and land use planning. Because of time constraints and the interconnectedness of the work program, the results of ongoing environmental studies were fed into successively more detailed plans. The proposed site plan that has resulted is described below. It reflects environmental constraints and opportunities, as well as other development requirements. In some instances, trade-offs were inevitable. The final result represents the best consensus of a wide range of interest groups with competing goals and objectives.

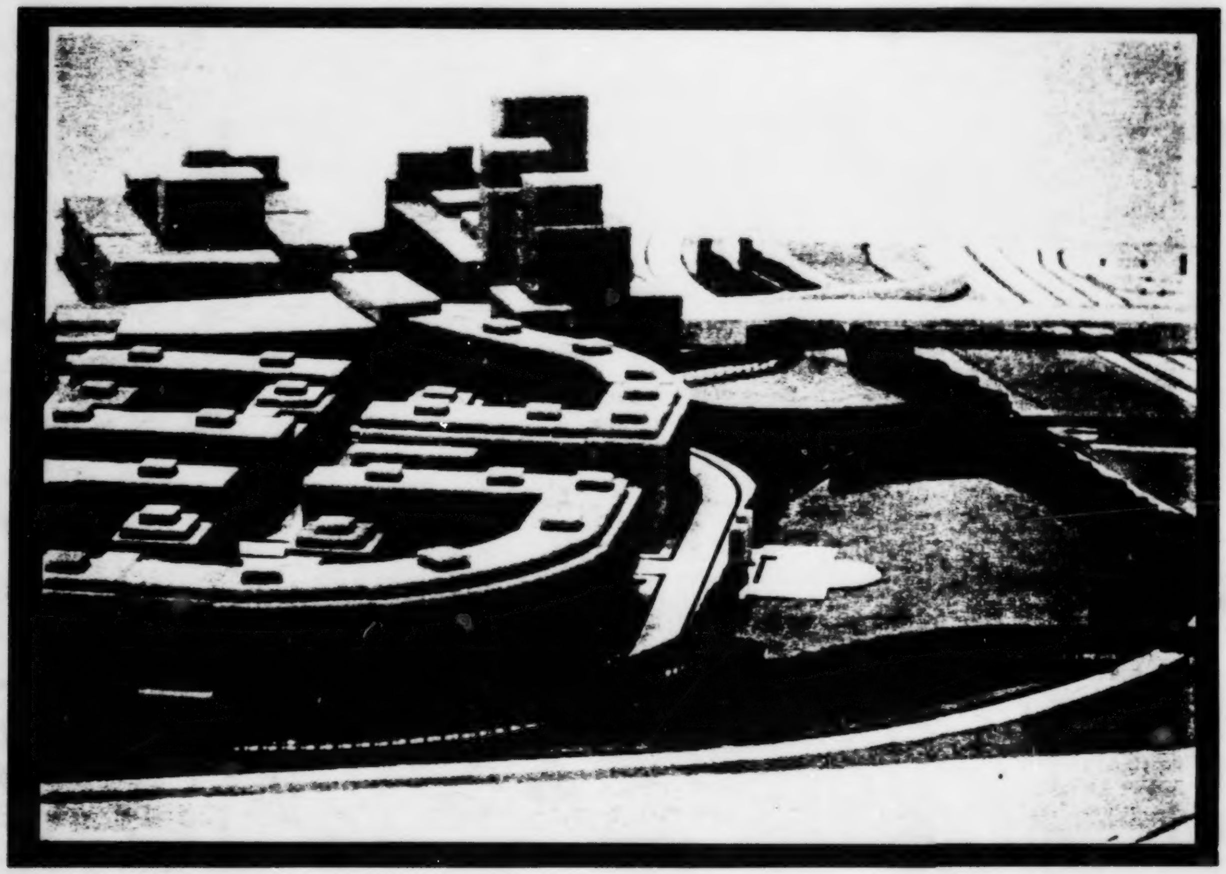
9.2 The Preliminary Site Plan

A preliminary site plan for Ataratiri was developed in July 1988 to demonstrate that the proposed redevelopment would work from economic and urban design viewpoints (City of Toronto and Province of Ontario, 1988). Although the major environmental concerns were known at that time, very little field research had been carried out to quantify their magnitude and extent at that time. A simplified street, blocks and massing plan was prepared to show one possible way of redeveloping the site (Figure 9.1). The July 1988 plan attempted to extend the surrounding street grid into the site. It suggested a large park in the centre of the community, surrounded by medium-rise buildings. Taller buildings were proposed for the east end of the site, overlooking the Don River.

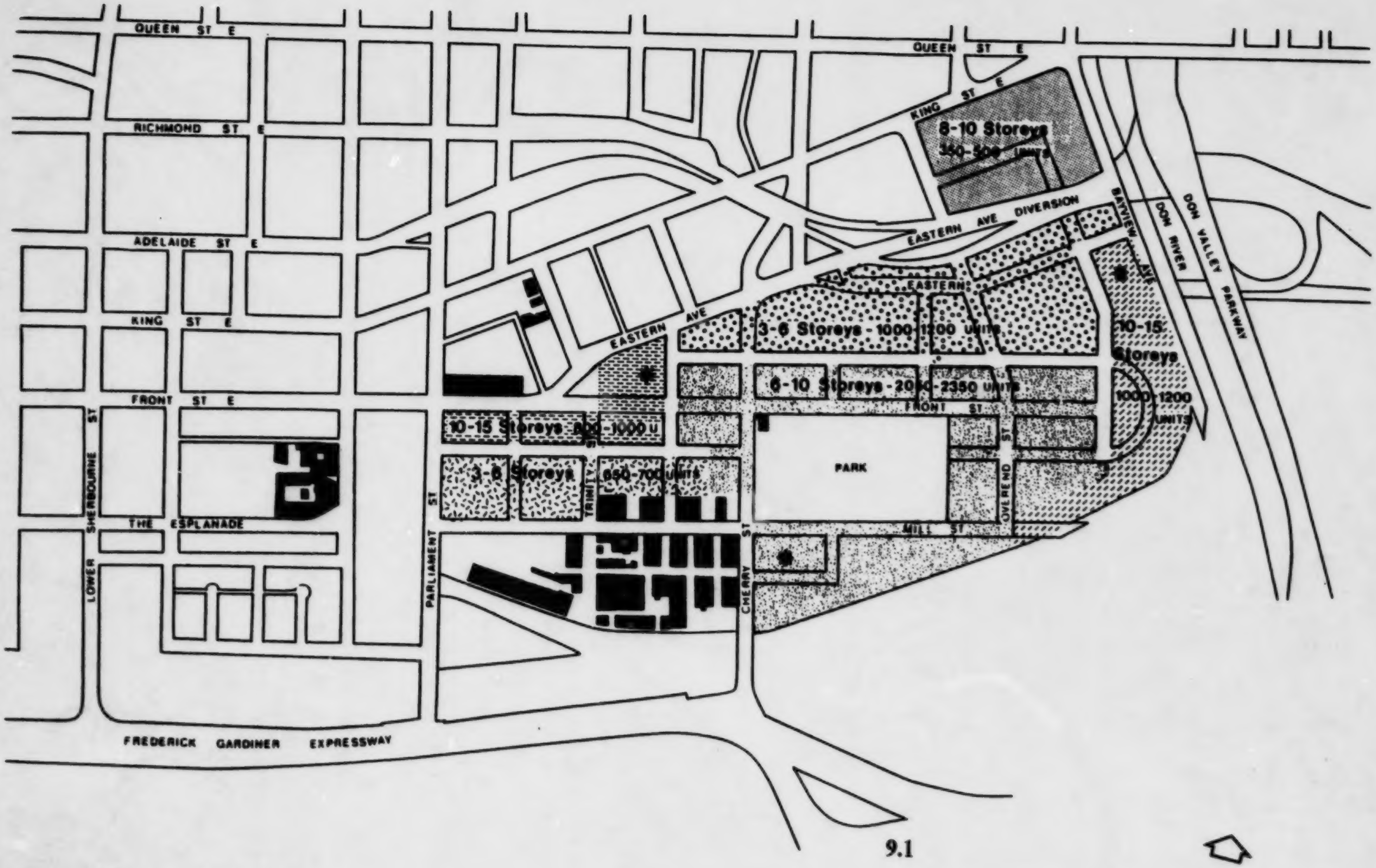
9.3 Developing A Site Plan That Responds to Environmental Conditions

9.3.1 The Site Planning Process

The site planning process has progressed through three stages. The first stage, completed in mid-1989, identified general urban design issues at the site and generated ideas for how Ataratiri might be laid out. Figure 9.2 illustrates one of the concepts which drew a considerable amount of favourable attention because of its treatment of the Don River edge. The idea of establishing community open space alongside the river struck a responsive chord with citizens, politicians and professionals who were promoting the



Working Model (September 1990)


QUEEN ST E
RICHMOND ST E
ADELAIDE ST E
KING ST E
FRONT ST E
THE ESPLANADE
LOWER SHERBOURNE ST
PARLIAMENT ST
TRINITY ST
CHERRY ST
MILL ST
OVEREND ST
FRONT ST
EASTERN AVE
EASTERN AVE DIVERSION
EASTERN
BAYVIEW AVE
DON RIVER
DON VALLEY PARKWAY
FREDERICK GARDINER EXPRESSWAY
PARK
8-10 Storeys 350-500 units
3-6 Storeys - 1000-1200 units
6-10 Storeys - 2050-2350 units
10-15 Storeys
1000-1200 units
10-15 Storeys 800-1000 U
3-6 Storeys 650-700 units

9.1

**Preliminary Concept Plan
(July 1988)**

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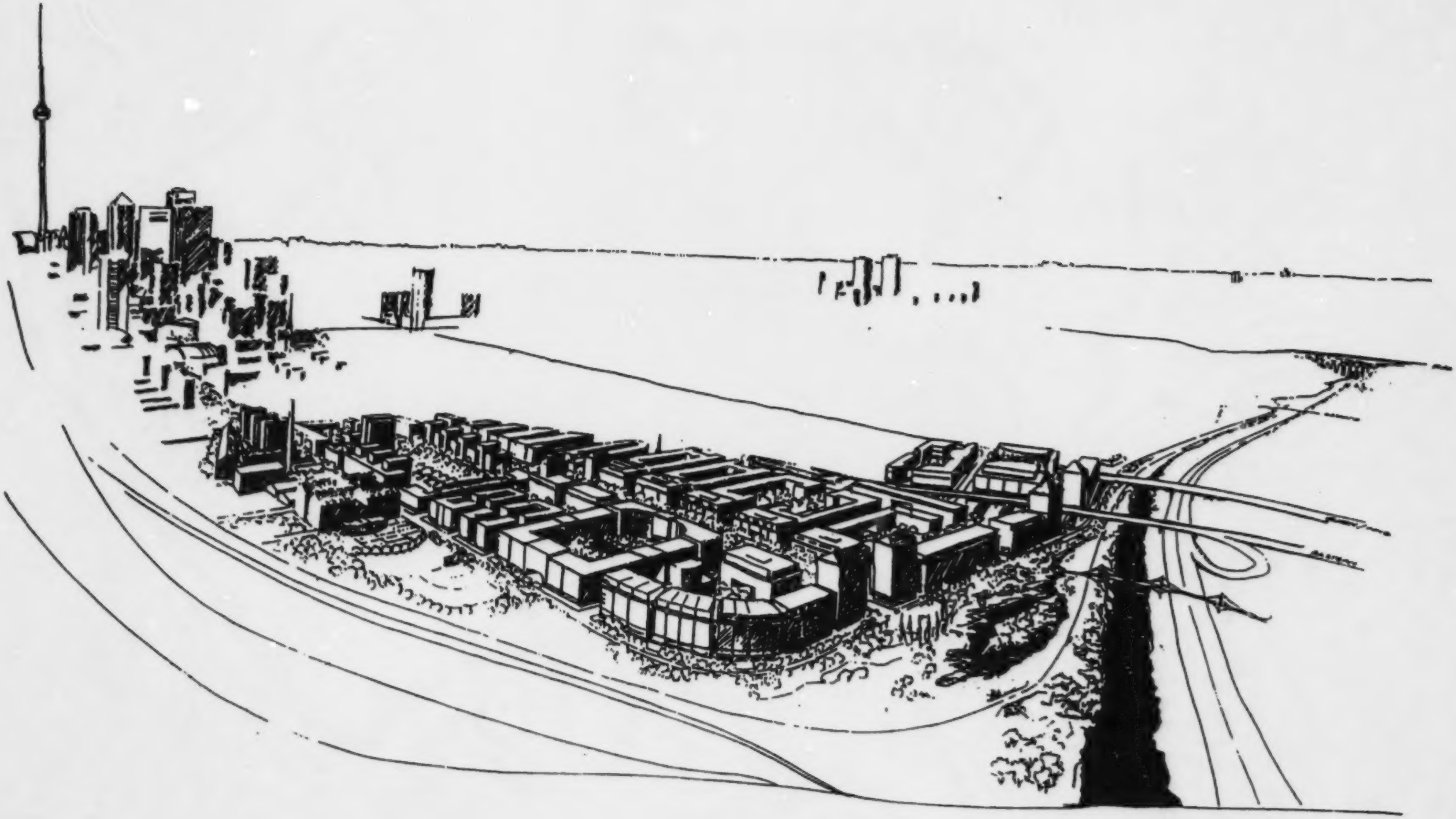
natural regeneration of this abused and neglected watercourse. The second stage involved taking the most promising urban design issue ideas and testing them in a series of more detailed studies on building and block design (Spaziani and Fong, 1990), road layout (A. J. Freedman & Associates, 1990) and open space design (Hough, Stansbury and Woodland 1990). In the third stage, the results of these studies and the background environmental studies were synthesized into the current site plan which is described in Section 9.4. In some cases physical and numerical models were used to analyze the parts of the site plan that presented difficulties and identify possible solutions. Further fine-tuning of this sort is expected to continue until actual construction begins.

9.3.2 Information Exchange

During the third stage of the site planning process, ongoing feedback between the environmental and the site planning research was carried out in a number of ways. Initially, the site planning consultant was informed about the magnitude and extent of environmental concerns and provided with any environmental reports that were available at the time. The consultant was also advised that any new information that came out of the environmental studies that could have site planning implications would be forwarded as it became available. In this way it was possible to avoid making irreversible site planning decisions too early in the process. However, it soon became evident that it would also be necessary to have the environmental consultants review the developing site plan and confirm that it would adequately address environmental problems and not create any new ones.

9.3.3 Review and Testing By Environmental Consultants

As the site plan progressed, the environmental consultants were brought in to review it and recommend changes. These meetings were helpful in identifying potential problems with the site plan before irreversible site planning decisions were made and in fine tuning the work programs of the environmental consultants. For example, at one of the meetings between the site planning and environmental consultants it was agreed that all buildings would be located at least 30 m from the rail corridors. At the same meeting it was determined that the work of the air quality consultant would need to be expanded because the numerical air quality modelling that was being carried out did not look at buildings that were taller than 50 m and did not address recent changes that had been made in the road layout. Other specialist consultants were also brought in to review and comment on the evolving site plan. As a result, the site plan that developed addressed not only environmental considerations, but issues such as appropriate urban design, efficient traffic circulation, adequate physical servicing and the provision of necessary community and social services.



9.2

Illustration from Urban Design Issues Studies (1989)

9.4 The Current Site Plan

9.4.1 Overview

In responding to environmental conditions, the current Ataratiri site plan (Figure 9.3) differs a great deal from the July 1988 plan. Where relatively intensive development had been shown at the eastern edge of the site adjacent to the Don River, a floodway and large park are now proposed. The park at the western border of the river's edge is defined by a raised earth embankment that will provide flood protection for all of the downtown area. Fill will be placed behind the embankment, producing grades that gradually taper back to the existing elevation of the site's interior.

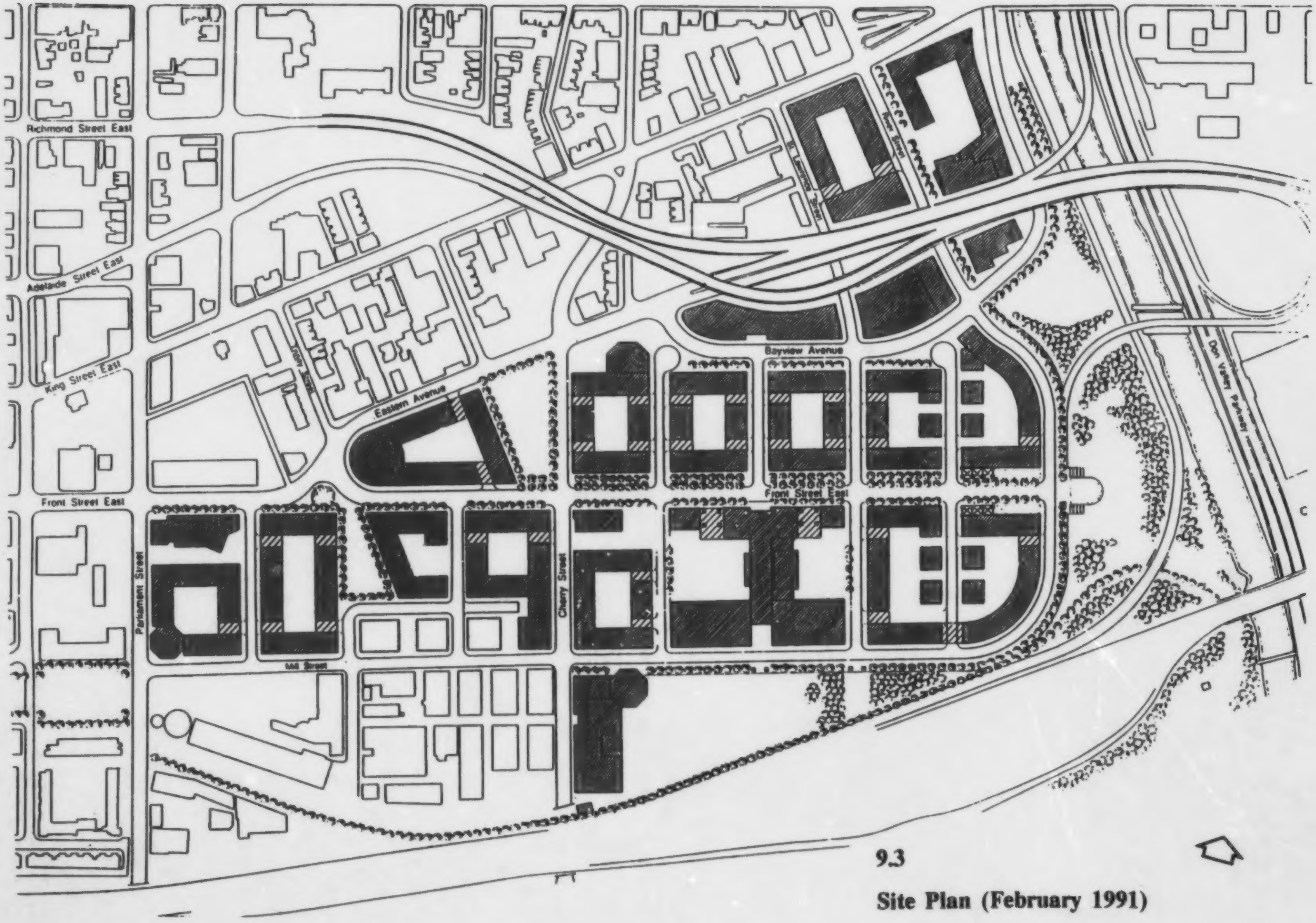
9.4.2 How the Current Site Plan Responds to Environmental Conditions

In the current site plan all buildings are set back a minimum of 30 m from the rail corridors that border the southern and eastern edges of the site. This setback eliminates the need for vibration control through the dampening effect of distance from the source. It also reduces the level of individual risk to residents associated with the transportation of dangerous goods to below ten-in-a-million, the maximum acceptable level according to a City of Toronto policy. In general, residential building setbacks are greater than 30 m to place them further from major sources of noise, vibration and risk.

As a result of these setbacks, major open spaces are located on the southern and eastern edges of the site, with smaller parks situated in the core of the neighbourhood - the opposite of July 1988 open space plan. The park next to the Don River is expected to be a significant neighbourhood amenity. It will compliment City-wide initiatives to revitalize the Don River and link it to the waterfront to the south. The planting of trees in the Don River park will assist in filtering suspended particulate matter from the transportation corridors out of the air. Fortunately, geotechnical constraints are dealt with by not building along the western edge of the Don River where the former Don River valley was located. Bedrock falls off sharply in this area, making the construction of building foundations an expensive undertaking.

The proposed park system also provides opportunities to create a bicycle path network that links up with existing recreational paths in the Don River valley and commuter paths on city streets to the west of the development. The promotion of bicycles, pedestrians and public transit services in Ataratiri is intended to further the City's recently adopted policy of reducing automobile use.

The decision to raise the grade of part of the site by placing fill for floodproofing purposes means that four substandard storm sewers that currently drain directly into the Don River and surcharge in times of high water can be eliminated. A storm water management system has been designed that will re-direct all runoff from the site to a new underground


Richmond Street East
Adelaide Street East
King Street East
Front Street East
Parliament Street
Trinity Street
Eastern Avenue
Bayview Avenue
St. Lawrence Street
River Street
Front Street East
Cherry Street
Mill Street
Don Valley Parkway

9.3

Site Plan (February 1991)

retention tank where sediment can settle before the runoff is pumped to the lake. The tank will greatly improve the quality of storm water leaving the site and can be accommodated under the park at Ataratiri's southern border.

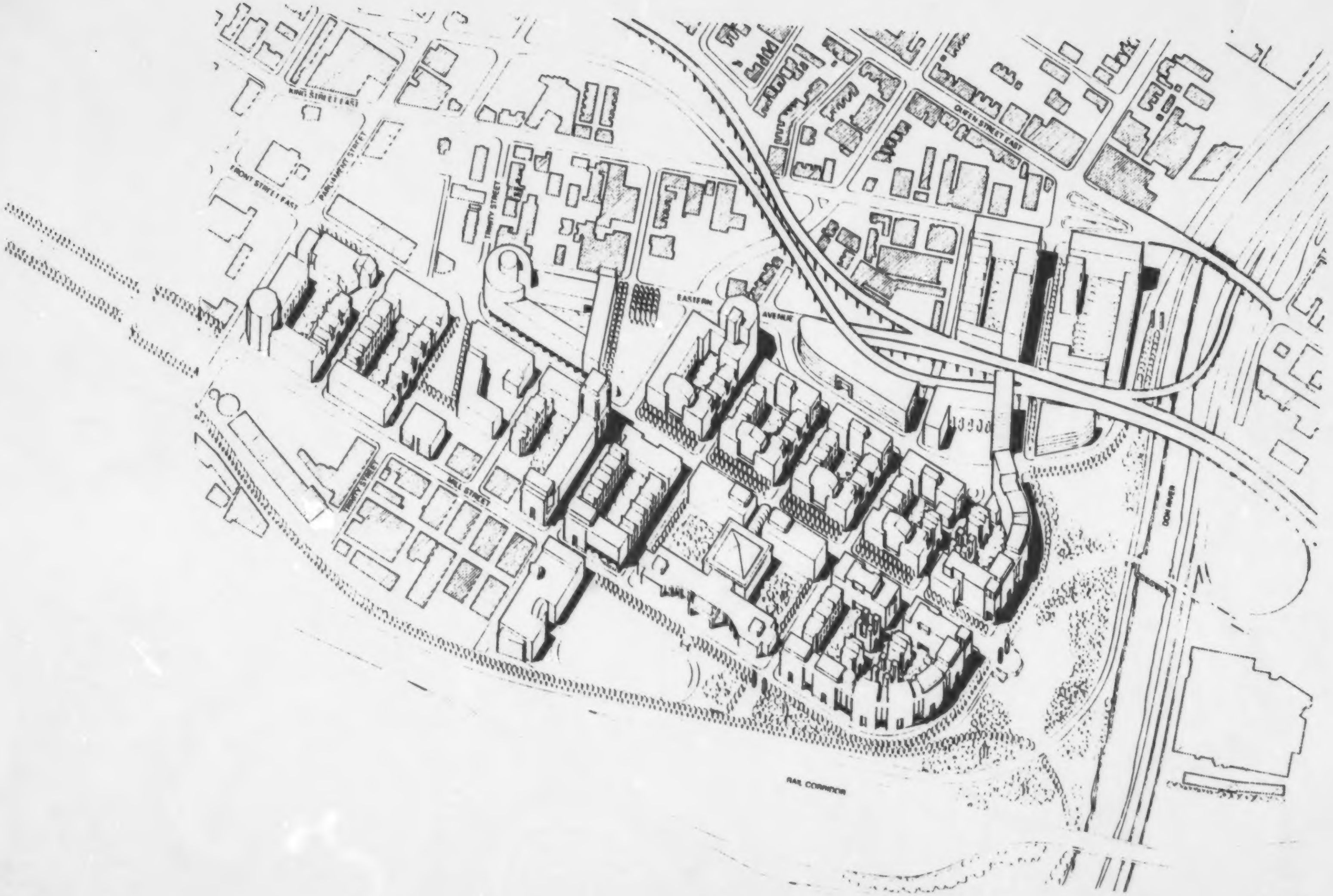
The heights of buildings on the southern and eastern edges of the site have been established in part to protect the interior of the site from noise. Within each development block, outdoor living areas are located on the inside of blocks so that they are sheltered by the surrounding buildings. This plan also improves safety and facilitates control of and access to the space by its users. The general massing shown in Figure 9.4 includes significant changes from earlier versions and has since undergone further changes due to continued testing.

Environmental considerations have also influenced land use decisions. For example, the noise and vibration study has identified the area beside the Eastern Avenue diversion as a part of the site with particularly high noise levels. To address this situation, industrial and/or commercial uses have been located beside the Eastern Avenue diversion where they will act as a buffer to nearby residential and mixed-use development. Residential will only be allowed if noise levels can be dealt with by single aspect buildings, which face away from the elevated roadway, and by interior layout and construction techniques which reduce indoor noise levels to within the MOE's noise guidelines.

In other instances, however, environmental conditions have led to conflicting solutions. This is the case with soil quality conditions at Ataratiri. Allocation of land uses is one method that could have been used to minimize the areas of the site requiring soil clean-up. Areas of the site which exceed the soil quality guidelines for residential use but meet the guidelines for industrial and commercial use could be zoned for industrial or commercial purposes. Although this approach can be cost effective and technically possible from a soil clean-up point of view, it has not been widely used at Ataratiri partly because it did not harmonize with other environmental and planning objectives. Generally speaking, soil quality in the interior of the Ataratiri site is better than soil quality around the boundary of the site. However, basing land use decisions on soil quality would have resulted in industrial and commercial uses being concentrated in the centre of the site, pushing residential uses towards the boundary where the residents would be closer to sources of noise, risk and air pollution. It was decided not to make site planning decisions on the basis of soil quality because there are techniques available to clean soil, large areas of the site will require clean-up regardless of future use, and the cost of clean-up to industrial/commercial levels was not expected to be greatly different from the cost of clean-up to residential levels.

9.4.3 The School Sites

A case in point are the school sites, located near the centre of the overall development


KING STREET EAST
PARLIAMENT STREET
FRONT STREET EAST
TRINITY STREET
EASTERN
AVENUE
QUEEN STREET EAST
MILL STREET
TRINITY STREET
DON RIVER
RAIL CORRIDOR

9.4

Axonometric (August 1991)

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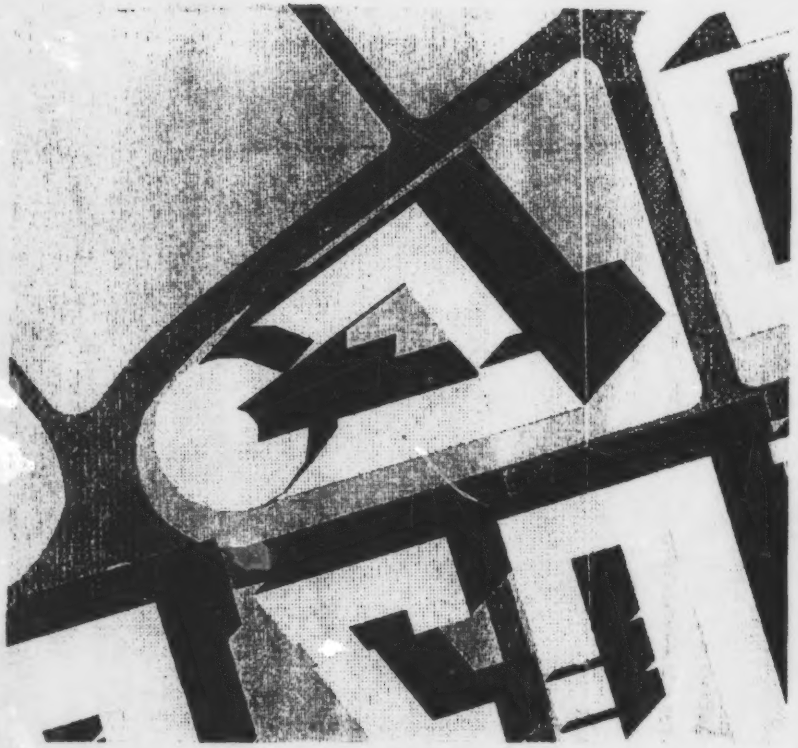
on a large block east of Cherry Street bounded by Front, St. Lawrence and Mill Streets. An earlier version of the site plan had two elementary schools (one Public and one Separate) located next to each other, facing north to Front Street, the central spine of Ataratiri. Their playgrounds were proposed to be located beside each other, in the centre of the block, with taller residential structures forming a boundary at the southern end of the block. Noise studies determined that this arrangement would provide adequate noise control for the open areas on the block.

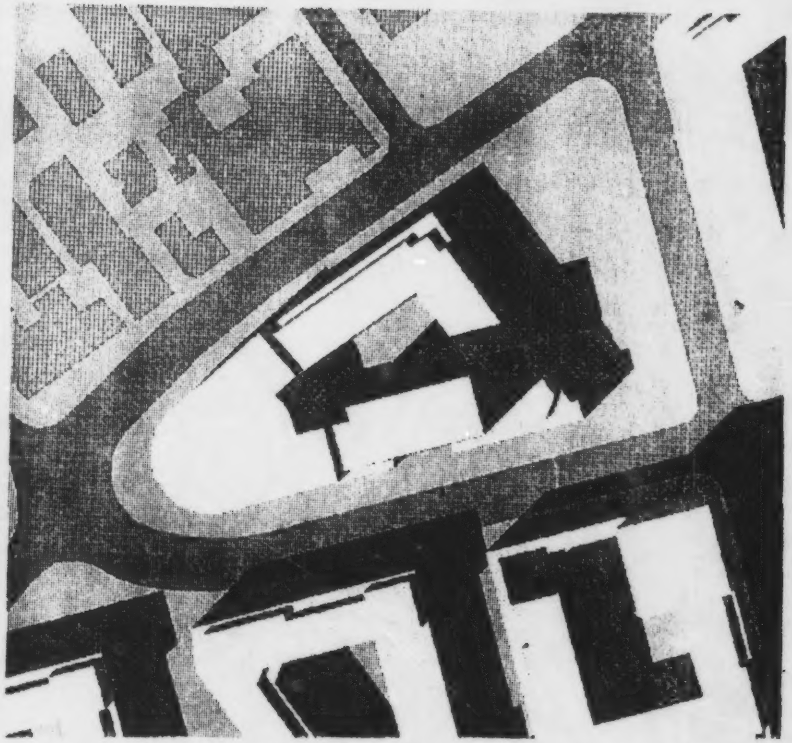
Upon reviewing this plan the two school boards expressed concern about the apartment buildings to the south shadowing the playgrounds and the stacking of housing above the schools. They also preferred that the schools face the southern public open space, rather than the community's main shopping street. In response, the school site plan has now been "flipped" locating the relatively low school buildings on the southern border of the block and placing the apartment buildings on the northern edge, facing Front Street. Noise calculations have been redone to determine the effectiveness of the lowered perimeter buildings in reducing road and rail traffic noise from the major transportation corridors to the south, in the school yards. The revised calculations show that noise levels in the school playgrounds behind a three-storey school building can be reduced to less than 55 dBA (the guidelines for outdoor living areas) if a 4.5 metre high noise fence is erected alongside the railway tracks. Without the noise barrier, a four-storey building or a three storey building with a pitched roof is required to achieve the same result. Following the preparation of the plan shown in Figure 9.4, most of the housing has been moved away from the schools and their playgrounds. In their current location, the schools are located approximately 90 m from the rail corridor where the individual risk levels are less than one-in-a-million.

The most recent school yard layout will ensure that playgrounds receive good sunlight penetration and enjoy direct access and visibility from public streets. Sun/shade studies have now been done for the entire site to determine the maximum heights of buildings that will allow adequate sun access for the surrounding public open space, including streets and parks. The standards that were used result from the work of consultants hired to do a sun, wind and pedestrian comfort study as part of the City's review of its official plan policies for all of the Central Area (which includes Ataratiri). The building heights proposed in the final site plan had been developed with these standards in mind, but had not been rigorously tested. Once the site plan was nearing completion, it was modelled on a computer using a software program that provides accurate shadow information for a given geographical location at any specified date and time of the year.

The test results confirmed that most public sidewalks would receive the recommended minimum 5 hours of direct sunlight on the autumn equinox, and the public parks would have at least the recommended 50% of their area in direct sunlight for at least 6 hours daily during the spring and summer. Slight deficiencies were noted in a few areas. At this point, a consultant had been hired to refine the plan and building heights in preparation



1. Initial Site Plan (February 1991)



2. Revised Site Plan (May 1991)

9.5

Sun/Shade Testing of Site Plan (test date: Sept. 21, 3:18 p.m.)

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for implementing the first phase of development. To deal with shadowing concerns, they recommended a setback of the upper storey of buildings fronting on the sensitive streets and an overall lowering of the building wall adjacent to one of the centrally located parks. The revised building heights were re-tested and found to meet the minimum sun penetration standards. The results of the sun/shade testing on the inital and the revised site plan are shown in Figure 9.5.

9.5 Summary

In many ways, the environmental problems and opportunities at Ataratiri site are in harmony with other site planning objectives. The Don River edge park, for example, recognizes the limitations imposed by the depth to bedrock, can be integrated with the floodproofing of the site, will encourage natural habitat restoration, will act to reduce the impact of off-site sources of noise and vibration, air pollution and risk, and can provide excellent recreational opportunities and a high level of urban amenity. Where there has not been harmony all of the among environmental and planning objectives, as in the case of matching soil conditions with future land use decisions, conscious trade-offs have been made.

10.0 ENVIRONMENTAL AND PLANNING APPROVALS PROCESS

10.1 Overview

The environmental, land use and flood plain planning approval processes being followed to obtain the municipal and provincial approvals required to permit redevelopment at Ataratiri are described in Section 1.3. These three approval streams have been proceeding in parallel and come together in the Part II Official Plan which will be submitted to City Council and the Minister of Municipal Affairs for approval after this EES report has been submitted to the Minister of the Environment for approval. The Part II Official Plan will contain City Council's planning policies for Ataratiri and a framework for their implementation. Coordination among these three processes has been provided by involving many of the same agencies in each of the three planning processes. All of the agencies that are involved in the SPA process also are on the provincial review team that has been formed by the MOE Environmental Assessment Branch to review this EES report. All of the agencies on the provincial review team also will receive a copy of the *Ataratiri: Part II Official Plan Proposals* report (September 1991) and the *Ataratiri: Part II Official Plan Final Recommendations* report (in prep) for review and comment.

Condition 2 of the Exemption Order requires that the EES report contain:

- a description of the environmental planning and approvals process under the Planning Act and other statutory authorities including the sequence of development from the Official Plan Amendment to Zoning By-law amendments for each area of the site; and

- a description of agreements that will be entered into by the City for each part of the site.

Accordingly, the land use controls that are being considered for use at Ataratiri, the environmental and planning approvals process that is likely to be followed in developing the site, and the types of legal agreements that can be entered into by the City are described below and summarized in Figure 10.1. The proposed approach brings together Exemption Order requirements, Planning Act requirements and procedures, and existing City policy into a comprehensive environmental and planning approvals process.

10.2 Land Use Controls

10.2.1 Official Plan

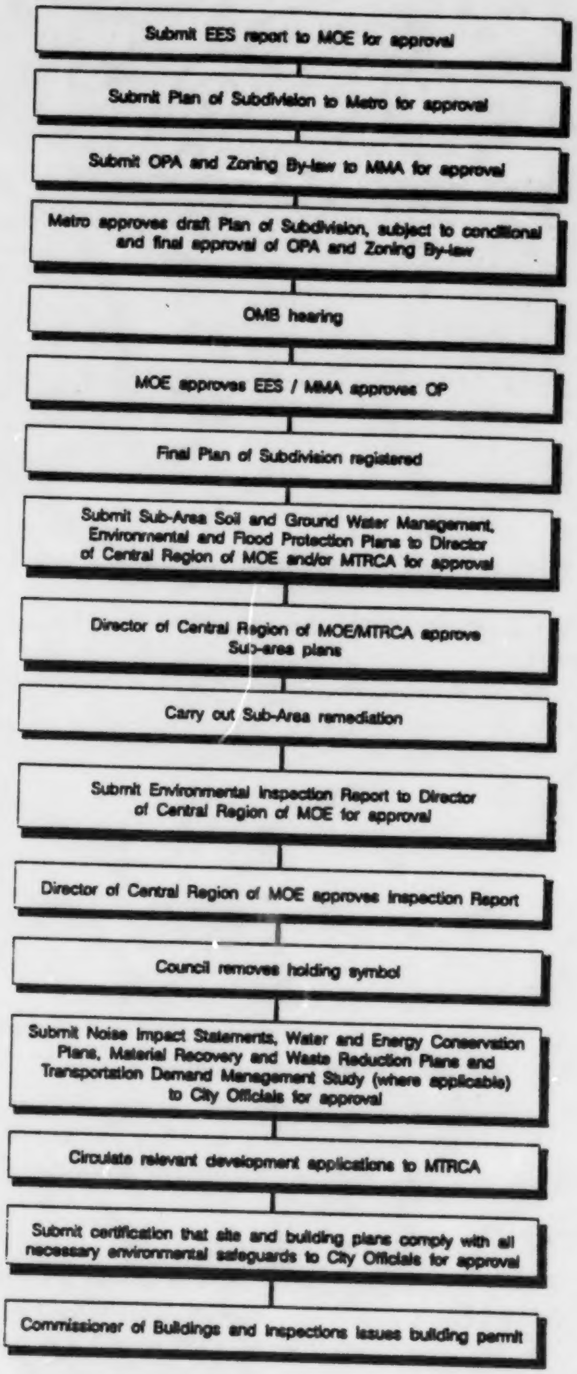
The Part II Official Plan for Ataratiri will become an amendment to the City of Toronto Part I Official Plan and will provide the authority for the City to prescribe a number of detailed controls over the development of Ataratiri. The Part I Plan applies to the entire City. Part II Plans are developed on a neighbourhood basis to provide more detailed policies, or amended policies, that relate more closely to the local situation. The Part II Plan can be viewed as an overall framework that will tie into other specific regulatory mechanisms such as the zoning by-law, plan of subdivision and Section 40 development review (described below). The detailed regulations are necessary to implement Council's policies regarding Ataratiri; the Part II Plan will state those policies and give the context and reasons for their implementation. The policies which will be described in the Part II Plan for Ataratiri will respond to the requirements of the Ataratiri Exemption Order and will also reflect additional initiatives undertaken by the City, such as automobile minimization, waste management, and energy and water conservation. The Part II Plan amendment, which is now being prepared, will be submitted to the Minister of Municipal Affairs for approval after this EES report has been submitted to the Minister of the Environment for approval.

10.2.2 Zoning By-law

The current zoning by-law for Ataratiri permits only industrial activities. A zoning by-law amendment is required to permit the proposed change in land use. The new zoning by-law amendment for Ataratiri will be one of several means of implementing the environmental policies contained in the **Part II Plan**. Environmental concerns will be dealt with in the zoning by-law amendment in two general ways.

First, the zoning for Ataratiri will prescribe what land uses are suitable for different areas of the site. In areas where existing environmental problems (i.e., noise, risk of flooding, risk of accidents on rail corridors) can not be solved, development may not be allowed. Areas exposed to the highest constraints will be restricted to open space activities. This will include portions of the site located in the floodway created by the proposed flood protection measures, and areas where the risk of accidents involving the transportation of dangerous goods on the rail corridor is greatest. Uses that are not suitable for a primarily residential community, such as activities that use or produce dangerous or hazardous materials, emit noxious odours, produce excessive noise or vibration will be prohibited in Ataratiri. The temporary storage and possible future treatment of PCB waste will need to comply with the requirements of Regulation 11/82 under the Environmental Protection Act (EPA) which requires PCB waste to be stored at the site where it is produced until a treatment method or an alternative storage facility is approved. At this time, there are no alternative storage locations for the PCB waste nor an approved method of treatment.

Second, the zoning will impose restrictions on the siting and physical form of development to lessen noise impacts. The restrictions will include setbacks and build-to lines, height limits, and the location of open space areas. Together these zoning controls will result in a building form and layout that shields outdoor living areas located in the courtyards


Submit EES report to MOE for approval
Submit Plan of Subdivision to Metro for approval
Submit OPA and Zoning By-law to MMA for approval
Metro approves draft Plan of Subdivision, subject to conditional and final approval of OPA and Zoning By-law
OMB hearing
MOE approves EES / MMA approves OP
Final Plan of Subdivision registered
Submit Sub-Area Soil and Ground Water Management, Environmental and Flood Protection Plans to Director of Central Region of MOE and/or MTRCA for approval
Director of Central Region of MOE/MTRCA approve Sub-area plans
Carry out Sub-Area remediation
Submit Environmental Inspection Report to Director of Central Region of MOE for approval
Director of Central Region of MOE approves Inspection Report
Council removes holding symbol
Submit Noise Impact Statements, Water and Energy Conservation Plans, Material Recovery and Waste Reduction Plans and Transportation Demand Management Study (where applicable) to City Officials for approval
Circulate relevant development applications to MTRCA
Submit certification that site and building plans comply with all necessary environmental safeguards to City Officials for approval
Commissioner of Buildings and Inspections issues building permit

EES - Environmental Evaluation Study
MOE - Minister of the Environment
OPA - Official Plan Amendment
MMA - Minister of Municipal Affairs
OMB - Ontario Municipal Board
MTRCA - Metro Toronto and Region Conservation Authority

10.1

The Relationship between the Environmental and Planning Approval Process

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of buildings from excessive noise while ensuring adequate sunlight penetration.

Section 35 of the Planning Act permits municipalities to use a "holding symbol" along with the zoning assigned to particular properties. The purpose of the holding symbol is to prevent the new zoning from coming into effect until certain provisions specified in the Official Plan are met. Council must pass an amending by-law to remove the holding symbol. Public input into Council's decision to remove the holding symbol occurs when the by-law is considered by the Land Use Committee. Section 5b) of the Exemption Order for Ataratiri requires that all of Ataratiri be subject to a holding symbol. The Part II Official Plan for Ataratiri will describe the criteria for removing the "holding symbol". These will include the submission and approval of the Environmental Inspection Report referred to in Section 5b) of the Exemption Order (see Section 9.3.2).

10.2.3 Plan of Subdivision

The Planning Act requires that major tracts of land proposed for development have a subdivision plan. Section 50 of the Planning Act outlines the requirements of, and process for, subdivision plan approval which aim to ensure that development happens in an orderly fashion with the appropriate services in place. Municipally owned land is not required to have a subdivision plan, however, the Part II Official Plan for Ataratiri will require that all of the site be developed through a plan of subdivision.

The subdivision approval process is the primary way of implementing environmental policies. There are three main advantages of having a plan of subdivision. First, it allows the municipality to impose a number of conditions of development which may not otherwise be easily secured legally. Foremost in the case of Ataratiri is the ability to require the environmental investigation procedures that are stipulated in the Exemption Order and the specific environmental clean-up and flood protection measures that arise through the EES and SPA approval processes. The plan of subdivision for Ataratiri will specify a particular layout and grading of the site that takes into account environmental constraints, including appropriate flood and storm water control, the need for buffering areas and the provision of routes to provide emergency access. Second, conditions of draft plan approval and requirements included in subdivision agreements will ensure that development phasing is coordinated with soil and groundwater clean-up and flood protection. Third, Section 50 of the Planning Act provides the legal authority to require agreements to be entered into that are registered on title and bind successive owners. In the case of Ataratiri, this permits the City to require the design and construction of individual projects to comply with the environmental requirements that will be identified through subsequent studies (see Section 9.3).

The Part II Official Plan will identify those requirements that the City will request as conditions to the plan of subdivision approval for Ataratiri. Final approval powers for plans of subdivision rest with the Municipality of Metropolitan Toronto. The Metro Commissioner of Planning circulates subdivision applications to a large number of agencies and government authorities, including the Central Region office of the MOE and the MTRCA. A usual precondition of plan of subdivision approval is to have the zoning for the proposed uses in place.

10.2.4 Site Plan Control

The entire Ataratiri site will be designated as an area of site plan control under Section 40 of the Planning Act. The Part II Official Plan will describe the various site planning issues that will be considered in the development review process. The design of an individual project will have to meet these requirements and a condition of approval will be the entering into of a development agreement to secure, among other things, that the project be constructed substantially in accordance with an approved Development Plan. The types of environmental issues that may be addressed through the development review process are limited and they relate mostly to grading and the provision of facilities required for flood protection and storm water management. In processing Section 40 development review applications, the City's Planning and Development Department circulates all applications affected by environmental constraints to the Central Region office of the MOE and to the Environmental Protection Office of the City's Public Health Department. Applications for properties that are susceptible to the regulatory flood are circulated to the MTRCA.

10.3 Approvals Process

10.3.1 Sub-Areas

For development phasing, Ataratiri will be divided into three large sub-areas (Figure 10.2). Before any development is permitted in a sub-area, certain conditions will have to be met. These conditions will be identified in the Part II Official Plan and will be implemented through the subdivision approval process described above. The sub-areas have been defined in response to development opportunities and constraints within Ataratiri. Sub-area W is adjacent to established neighbourhoods and is connected by existing roads to the rest of the City. Development can proceed in this area without the need to construct an entirely new network of physical services (e.g., roads, placement of fill for flood protection) and utilities (e.g., sanitary sewers) although changes and improvements may be required. Development of sub-areas E and N is likely to lag behind sub-area W because of the large amount of fill required for flood protection and the need for new roads and sewers.

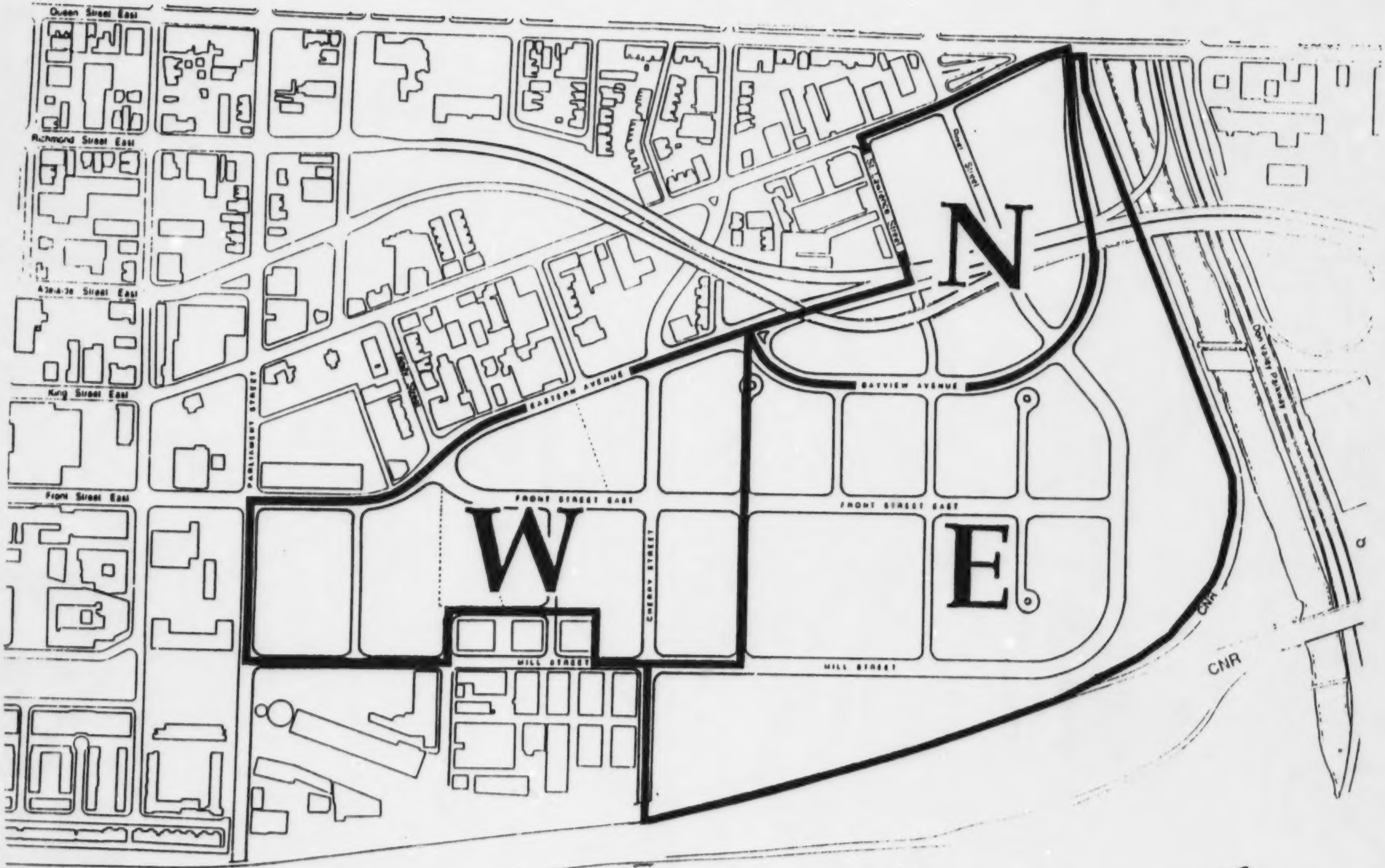
Sub-area approval will be conditional upon the satisfactory completion of a number of specific plans, three of which will take into account environmental concerns: an Environmental Plan; a Soil and Groundwater Management Plan; and a Flood Protection Plan. These plans may be approved independently of each other, and the clean-up measures carried out, but new development on a sub-area will not be permitted until all of the plans have been satisfactorily completed. All appropriate City departments and provincial agencies will be consulted in the development of these plans.

A sub-area Environmental Plan will contain the results of the detailed studies on air quality, noise and vibration, and transportation and fixed facility risk that are required to address the key concerns identified in the Conclusion and Recommendations Chapter of this EES report, and Condition 4 of the Exemption Order. These studies will identify the remedial measures which should be carried out prior to starting construction and those which should be carried out or completed after construction has started on parts of the site to which the remedial measures relate. The sub-area Environmental Plan will be submitted to the Director of the Central Region of the MOE for approval.

A sub-area Soil and Groundwater Management Plan will contain the detailed soil and groundwater management programs required by Condition 3 of the Exemption Order. The plan will include the results of the detailed soil and groundwater management, health risk and health and safety studies and/or programs identified in the Conclusions and Recommendations Chapter of this report. These studies will recommend the soil and groundwater clean-up that should be implemented on a development block basis and that which should be implemented on the basis of areas larger than a development block, those that should be carried out prior to the start of construction and those that should be carried out or completed after construction has started on parts of the site to which the remediation measures relate. The sub-area Soil and Groundwater Management Plan will be submitted to the Director of the Central Region of the Ministry of the Environment for approval.

A sub-area Flood Protection Plan will identify those flood control measures that should be carried out before construction begins and those that should be carried out or completed after construction starts on parts of the site to which the flood mitigation measures relate. It is likely that some of the larger scale flood protection measures (such as downstream channel improvements) will be undertaken outside of the sub-area(s) intended for initial development. In order to allow flood protection to begin at the earliest possible time, the approval process described here does not prevent the implementation of flood control measures in a portion of the site for which sub-area development approval is still pending, provided the sub-area Soil and Groundwater Management Plan has been approved. The sub-area Flood Protection Plan will be submitted to the MTRCA for approval.

As mentioned in Section 9.2.3, a condition in the subdivision agreement will be that development must comply with the recommendations of the approved sub-area


Queen Street East
Richmond Street East
Adelaide Street East
King Street East
Front Street East
Parliament Street
Eastern Avenue
Trinity Street
St Lawrence Street
River Street
Bayview Avenue
Front Street East
Cherry Street
Mill Street
Don Valley Parkway
CNR
CNR
N
W
E

10.2

Sub-Areas

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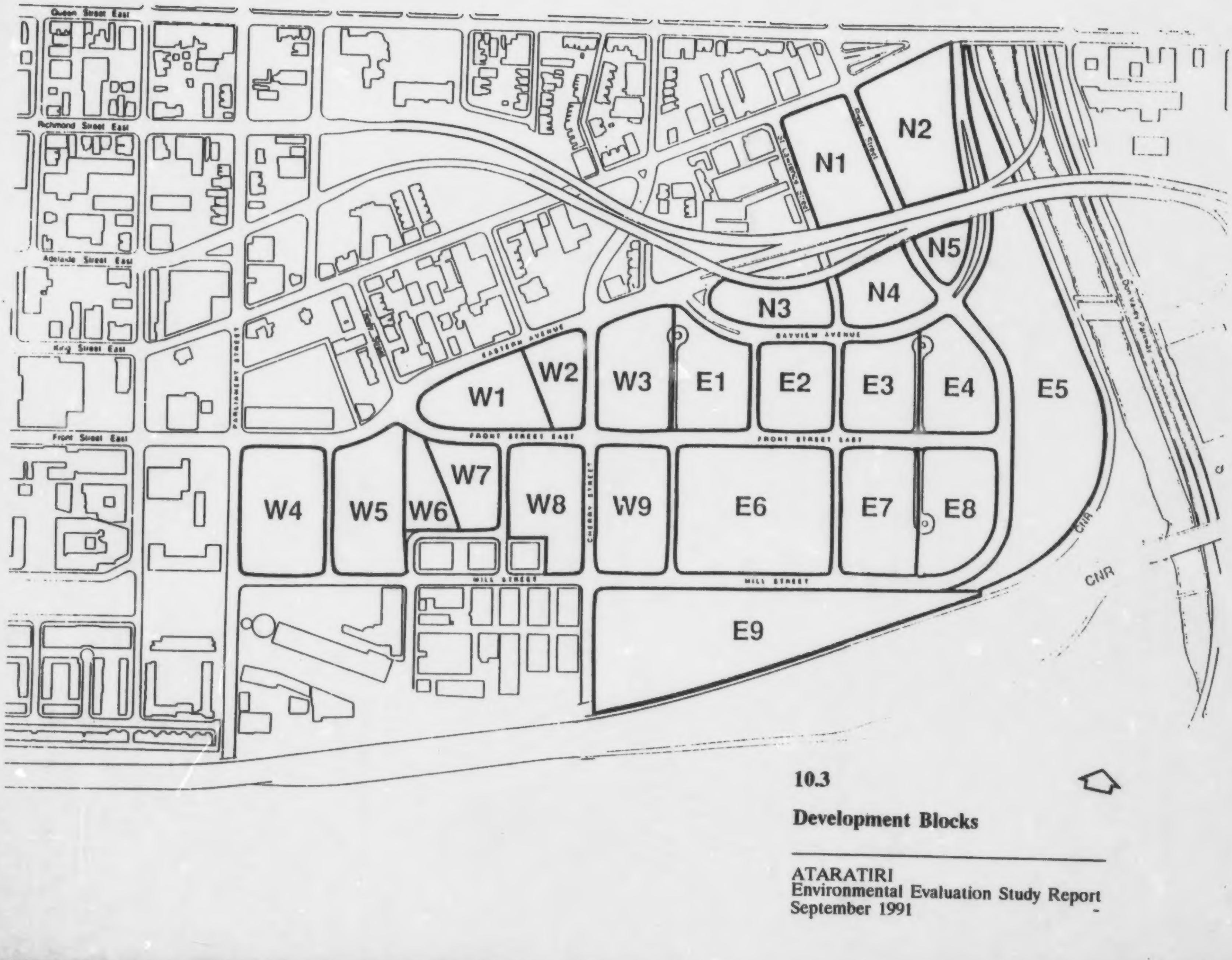
Environmental, Soil and Groundwater Management and Flood Protection Plans. Therefore, a legal means exists to ensure that environmental safeguards required by MOE and MTRCA will be incorporated into building design.

Conditions 3 and 4 of the Exemption Order require the " detailed soil and groundwater quality management programs" (i.e., the sub-area Soil and Groundwater Management Plan) and the "detailed environmental studies" on the "key concerns" identified in the EES report (i.e., the sub-area Environmental Plan and the sub-area Flood Protection Plan) to be prepared and submitted to the MOE "prior to the approval of zoning by-law amendments". Zoning by-laws rarely deal with detailed environmental matters, except where they affect the appropriate use of land and buildings or the siting and physical form of structures. Subdivision plans and agreements, on the other hand, typically do address detailed environmental matters. At the time the Exemption Order was granted, it had not been determined whether Ataratiri would be developed by way of a plan of subdivision. Since the Part II Official Plan Proposals report will recommend that the subdivision approval process be used at Ataratiri, it seems reasonable to require that the successful completion of detailed environmental studies be a condition of subdivision phasing, rather than a condition of zoning approval. The end result is the same: development can not start until the MOE and the MTRCA are satisfied that the necessary environmental remediation has or will take place. Making the approval of detailed environmental studies a condition of subdivision phasing, rather than zoning approvals, avoids the need for a separate and potentially lengthy rezoning process each time a sub-area is proposed for development. City staff has raised this matter with the staff of the MOE and have been advised that it may be possible to make a technical amendment to the Exemption Order to permit the detailed environmental studies to be a condition of zoning by-law approval, **or**, a condition contained within a Section 50 subdivision agreement.

10.3.2 Development Blocks

As mentioned in Section 9.1.2, all of Ataratiri will be subject to a holding symbol which must be removed before the new zoning comes into effect, allowing development to proceed on particular portions of the site. Development block approval can not be granted in advance of the relevant sub-area approvals. Removal of the holding symbol will be done on a development block basis according to criteria that will be specified in the Part II Official Plan. One of the requirements for removing the holding symbol will be that a public meeting be held to consider the amendment to the by-law allowing the holding symbol to be removed. However, it should be noted that Council's final decision to approve a Section 35 by-law to remove the holding symbol on a development block is not subject to appeal to the Ontario Municipal Board.

In general, the development blocks (Figure 10.3) chosen for Ataratiri are the size of normal city blocks. They represent development parcels of manageable size. A


Queen Street East
Richmond Street East
Adelaide Street East
King Street East
Front Street East
Parliament Street
Eastern Avenue
Bayview Avenue
Front Street East
St Lawrence Street
Power Street
Cherry Street
Mill Street
Don Valley Parkway
CNR
CNR
N1
N2
N3
N4
N5
W1
W2
W3
W4
W5
W6
W7
W8
W9
E1
E2
E3
E4
E5
E6
E7
E8
E9

10.3

Development Blocks

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development block is defined as the area bounded by public streets and will typically contain several development sites. Several development blocks make up a sub-area. Where the type and extent of soil and groundwater contamination does not require a larger area to be addressed, soil clean-up may be carried out on a development block basis.

Condition 5b of the Exemption Order for Ataratiri requires that the holding symbol on any part of the site only be removed when a consulting engineer has certified that the pre-construction remedial work required has been properly completed, and submitted a report setting out how the work was done, what, if any, work remains to be done, and that the property is safe for the intended land use. The submission and approval of this Environmental Inspection Report will be the main criterion for removing the holding symbol on a development block. The Part II Official Plan amendment for Ataratiri will require that the Environmental Inspection Report: certify that remedial work required by the sub-area Environmental Plan, the sub-area Soil and Groundwater Management Plan and the sub-area Flood Protection Plan to be carried out before construction begins on that part of the site has been properly completed; and describe how the remedial work has been carried out and what, if any, remedial work remains to be done. All appropriate city departments and provincial agencies will be consulted in the preparation of this report. The Environmental Inspection Report will be submitted to appropriate City departments for review before being submitted to the Director of the Central Region of the MOE for approval.

The wording proposed for the Part II Official Plan amendment is slightly different than the wording in the Exemption Order. This is because there is no definition of the word 'safe' in the Exemption Order. The proposed Official Plan wording assumes that the site will be safe for its intended use if the remedial work is carried out in accordance with the approved sub-area Environmental, Soil and Groundwater, and Flood Protection Plans.

Some development block approvals may be granted in advance of certain sub-area approvals. For example, soil and groundwater clean-up that has been approved by the MOE could start and be certified on development blocks within the sub-area while other planning issues unrelated to environmental concerns are still being worked out for the sub-area as a whole. Development would not be permitted, however, until all of the sub-area and development block requirements are satisfied.

10.3.3 Individual Developments

The Part II Official Plan for Ataratiri will identify building-specific requirements that must be met before final building permits are issued. These will include the submission of a number of reports on particular environmental concerns that are to be taken into account in the design and construction of an individual project. Reports on the following will be required for each development proposal, and must be submitted to the satisfaction of the

Commissioner of Public Works and the Environment: a class three noise impact statement; a water conservation plan; an energy conservation plan; and a material recovery and waste reduction plan; and a transportation demand management study (for projects with a non-residential parking supply exceeding 75 spaces). Developers will then have to enter into agreements, registerable on title and binding on successive owners, to ensure compliance with the recommendations of the reports. These agreements will be made under the authority of Section 50 of the Planning Act.

For any properties that are susceptible to flooding under the regulatory flood, development applications will be submitted to the MTRCA, in accordance with regulation 293/86 under the Conservation Authorities Act. Building permission will not be granted until the Conservation Authority has given its written approval of the submitted plans.

Finally, prior to the issuing of a final building permit, the developer will be required to provide certification to the Medical Officer of Health and the Commissioner of Public Works and the Environment that the site plan and building plan comply with all necessary environmental safeguards identified in the approved sub-area Environmental, Soil and Groundwater, and Flood Protection Plans.

10.4 Legal Agreements

The foregoing discussion of land use controls and approvals process mentions several agreements that will be entered into between the City and developers. In order to be registerable on title and binding on successive owners, these agreements will be made part of the subdivision approval process. The "master" agreement, then, will be the Section 50 subdivision agreement for the entire Ataratiri site. In accordance with the policies that will be outlined in the Part II Official Plan (as described above), the subdivision agreement will identify, in turn, all of the sub-area phasing requirements and the agreements that must be entered into before individual developments may proceed.

The types of environmental requirements that will be secured through legal agreements on an individual project basis include:

- that the design, construction and operation of the project will be in accordance with the recommendations contained in a noise impact statement approved by the Commissioner of Public Works and the Environment;

- that the design, construction and operation of the project will be in accordance with the recommendations contained in a report on a water conservation plan approved by the Commissioner of Public Works and the Environment;

- that the design, construction and operation of the project will be in accordance with the recommendations contained in a report on an energy conservation plan approved by the Commissioner of Public Works and the Environment;

- that the design, construction and operation of the project will be in accordance with the recommendations contained in a report on a material recovery and waste reduction plan approved by the Commissioner of Public Works and the Environment; and

- for projects with non-residential parking exceeding 75 spaces, the design, construction and operation of the project be in accordance with the recommendations contained in a report on transportation demand management approved by the Commissioner of Public Works and the Environment.

10.5 Environmental Approvals

The EPA is the main piece of legislation governing waste management activities in Ontario. Approvals under the EPA are required for some of the soil and groundwater clean-up options recommended for further consideration in Chapters 4 and 5 of this EES report. For example, Section 8 of the EPA requires certificates of approval to operate anything that may discharge contaminants into the air. Air stripping is an example of groundwater treatment options that would use mechanical equipment that would require a certificate of approval under Section 8. Part V of the EPA requires certificates of approval for the establishment and operation of waste management systems. Bioremediation and metal chelation are examples of soil treatment methods that would be considered as waste management systems and require a certificate of approval under Part V. On-site storage or isolation of more than 40,000 cubic metres of contaminated soil also requires approval under Part V of the EPA. Regulation 11/82 under the EPA regulates PCB waste management. Approvals will be required under this regulation to store and/or treat PCB wastes in Ataratiri.

The Metropolitan Toronto Sewer Use By-law 153-89 and the City of Toronto Sewer Use By-law 78-91 regulate discharges to storm and sanitary sewers. Only water that meets the criteria specified in the by-laws may be discharged. In the City of Toronto, approval from the City of Toronto Department of Public Works and the Environment and a Sanitary Discharge Agreement from the Municipality of Metropolitan Toronto are required for the discharge of groundwater to the sanitary sewer system. The Metropolitan Toronto Works Department has advised the City that water associated with dewatering activities in Ataratiri that meets the requirements of the Sewer Use By-law 153-89 and does not have organic compounds in excess of MENVIQ Level C can be discharged to sanitary sewers.

The Ontario Water Resources Act (OWRA) regulates the supply and distribution of water and the reception, treatment and disposal of sewage to surface waters or groundwaters.

The Act is in place to protect the quality of water and to ensure that the quantity of water is not unduly diminished. Under Section 24 of the OWRA a certificate of approval will be required to operate the proposed storm water detention facility which will discharge treated storm water into Lake Ontario. Disposal of water from dewatering activities during soil and groundwater clean-up and construction is not expected to require approvals under the OWRA because discharges will be to the sanitary sewer which is regulated by the Sewer Use By-law. However, if dewatering rates exceed 50,000 litres of water per day, a permit to take water will be required under Section 20 of the OWRA.

The necessary environmental approvals will be obtained from the appropriate agencies prior to implementing any environmental clean-up.

GLOSSARY

AADT	annual average daily traffic
absolute risk	frequency of occurrence of a specified consequence from all possible events associated with a particular hazardous activity, e.g., estimated number of fatalities per year from all possible hazardous release events associated with goods movement in the area
acoustical shadow	an area that is shielded from noise by a building, berm, etc.
acute (risk, hazard, toxicity)	a source of risk, hazard or toxicity from which the effects are felt in a short time
air toxics	a group of potentially toxic organic compounds that may be detected in air; includes volatile organic compounds and reactive hydrocarbons
ALRT	Advanced Light Rapid Transit
ambient air quality criteria (AAQC)	ambient air quality standards defined by the MOE in Regulation 296
ambient sound or noise level	sound level due to background noise sources such as road traffic, nature, etc.
A-weighted decibels	see dBA
ambient or background concentration	the concentration of a chemical in an environment or area that has not been affected by contamination (although urban background levels will be different from rural or pristine levels
background environmental studies	studies undertaken to identify key environmental concerns on and off the site including any effects on health, soil quality, air quality, noise and vibration, and water quality

barrier blocks	buildings that serve as noise barriers for other parts of the site
bench scale test	laboratory tests of a remediation technology, conducted on a relatively small scale
bentonite	a type of clay (montmorillonite) used as a low permeable boundary when compacted or placed as a slurry; highly absorbent to water and absorbent to some contaminants (i.e., metals, some organics)
BTEX	a group of volatile hydrocarbons including benzene, toluene, o-xylene, m+p-xylene and ethylbenzene
buffer zone	an area around a source of risk, hazard or nuisance that has restricted use in order to reduce the risk, hazard or nuisance to the exposed population
built form	refers to the sizes, shapes and spatial relationships among the buildings at a development
carcinogenic	adjective to describe the effect of a carcinogen, a substance which causes the development of malignant tumours
Certificate of Approval (C of A)	a document issued by the MOE that permits the applicant to construct, operate, alter, extend or replace a source of emissions to the environment
Class 3 Noise Impact Assessment	evaluation of the noise impacts of a development on the environment required by the City of Toronto Department of Public Works and Environment
clean-up level	a concentration of a chemical in soil that, if exceeded, indicates that clean-up is necessary
CO	carbon monoxide; an air pollutant generated by incomplete combustion

coal tar	a thick, organic mixture, produced during the distilling of coal
commodity mix	the relative amounts of different materials transported by rail or road
contaminants of concern	substances that are detected frequently in soil or groundwater at concentrations that exceed the guidelines
daytime	when discussing noise levels, the 16-hour period between 7:00 am and 11:00 pm
dBA	A-weighted decibel. A measure of sound level which relates closely to the loudness
decibel	a dimensionless measure of sound level
detection limit	the lowest level for which chemical concentrations can be accurately determined for a given analytical technique
Don Sorting Yards	the rail yards located immediately south of Ataratiri
environmental constraints	limits to development that result from an environmental concern
exposure pathway	route by which a chemical can travel either directly from the environment (e.g., soil, water, air) or indirectly into the human body via foods, inhalation, ingestion, dermal absorption, etc.
fire index	measure of the degree of the fire hazard associated with a particular system using and/or storing a flammable material; calculated from information on the materials handled at the facility combined with data from an examination of fire incidence records

fixed facilities	facilities that handle and/or store hazardous materials on-site
floodproofing	a combination of structural changes and/or adjustments incorporated into the basic design and/or construction of individual buildings, structures or properties subject to flooding so as to reduce or eliminate flood damages
flood protection	measures undertaken to reduce or eliminate flood damages; includes floodproofing, placement of fill, construction of a floodway, etc.
fluvial	of, found in, or produced by a river
fugitive source	not originating from a stack or a vent, i.e., open stockpiles of soil, unpaved parking areas, etc.
GAS	numerical dispersion model developed by the MOE for use with multiple sources
genotoxic	agents which interact or directly affect genetic material (e.g. DNA)
groundwater management plan	a combination of remediation options intended to result in groundwater conditions that comply with environmental requirements
groundwater monitor	an instrument used to measure water level elevations and obtain groundwater samples from geologic formations
hazard	a source of risk that does not necessarily imply potential for occurrence; a hazard produces risk only if an exposure pathway exists and if exposures create the possibility of adverse consequences

health risk assessment	evaluation of the likelihood (or probability) that a given exposure or series of exposures may adversely affect the health of individuals experiencing the exposures
heterogeneous	non-uniform in composition; heterogeneous fill may be soil containing construction debris or other material
HIWAY-2	atmospheric dispersion model designed to simulate dispersion of pollutants from line sources, such as roadways
impulsive noise sources	sound of very short duration, generally a single pressure peak
indicator parameter	a characteristic of soil that gives an indication of its overall quality, such as pH or conductivity
individual risk	annual probability that an individual will experience a specific adverse effect as a result of exposure to a specific hazard
in situ	in position; in its original place
Integrating Sound Level Meter	a sound level meter which is capable of being used to derive the equivalent sound level (Leq)
L(90)	the sound level exceeded 90% of the time
leachate	the liquid resulting from percolating water or other fluids through waste or soil which has dissolved organic and inorganic constituents from the material being leached
leachate toxic material	a material that, when subjected to a Regulation 309 leachate procedure, yields leachate with chemical concentrations that are 100 times or greater than those allowed in drinking water

Leq	equivalent sound level; a constant sound level which would result in exposure to the same total A-weighted energy as would the specified time-varying sound, if the constant sound persisted over an equal time interval
Leq(16)	averaged sound level over the 16-hour daytime period
Leq(8)	averaged sound level over the eight-hour nighttime period
line source	a series of individual noise sources which can be modelled or represented by a line of noise sources
Lmax	the maximum sound level recorded during the time period
minimum flood protection package	includes filling part of the Ataratiri site to raise grades a maximum of 3.5 metres, widening the openings of the CNR bridge and the downstream bridges, plus constructing a floodway south of the CNR bridge
MOBILE-3	mathematical model used to calculate gaseous emissions from roadways
MOE	Ontario Ministry of the Environment
native soil	overburden materials, such as sand, silt and clay, that are deposited by natural geologic and climatic processes as opposed to those materials emplaced by humans
NEF contours	noise associated with air traffic is described in terms of noise exposure forecast (NEF) contours and NEF contours of less than 30 or 25 are generally interpreted as being acceptable

Neighbourhood Advisory Council (NAC)	group established by City Council to work closely with City staff and provide input into the Ataratiri planning process
night-time	when discussing noise levels, the eight-hour period between 11:00 pm and 7:00 am
NO	nitric oxide; an air pollutant and constituent of NO_x generated by combustion
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen; a generic air pollutant category that includes the sum of all NO and NO_2 concentrations
O_3	ozone; a photochemical oxidant generally formed in the presence of sunlight, oxides of nitrogen and reactive hydrocarbons
off-site	not on the Ataratiri site, i.e, not on-site
on-site	the Ataratiri site which is bounded by Parliament Street to the west; Front Street East, Eastern Avenue, St. Lawrence Street, and King Street to the north; Bayview Avenue to the east; and the rail corridor to the south
outdoor living areas	refers to areas such as outdoor patios, backyards, children's play areas, and parkland used for passive recreation
overburden	materials of any nature that overlie the bedrock
PAH	polynuclear (or polycyclic) aromatic hydrocarbon; one of a family of organic compounds
PCB	polychlorinated biphenyl; colourless liquids historically used in electrical equipment

PCB waste	liquids containing PCBs at a concentration of more than 50 ppm by weight; any equipment that contains PCBs and is no longer in use
physical infrastructure	includes roads and sewers
phytotoxicological guidelines	guidelines designed to protect plant life from detriment due to exposure to contaminated soil
pilot scale test	a test of a remediation technology undertaken at less than full-scale
point-of-impingement (POI) standards	air quality standards set by the MOE in Regulation 308
"point" source	a stationary location where a substance is discharged
Quasi-Steady Impulsive Sound	a sequence of sounds emitted from the same source, having a time interval of less than 0.5 s between steady impulsive sounds
reactive hydrocarbons (RHC)	air pollutant hydrocarbon species with the exception of methane which participate in the photochemical production of ozone and smog
receptor	an organism that receives, may receive, or has received environmental exposure to a substance
Regional Flood	a flood that occurs when there is a Regional Storm
Regional Storm	an event duplicating the amount and distribution of rainfall produced in 1954 by Hurricane Hazel; normally forms the basis for determining regulatory flood levels; during this event, a flow of 1460 m^3 per second in the Don River is predicted at the Queen Street East bridge

registerable material	a material that, when subjected to a Regulation 309 leachate procedure, yields leachate with chemical concentrations that are between 10 and 100 times those allowed in drinking water
Regulatory Flood	a flood against which new development/ redevelopment in a flood plain must be protected
relative risk	risk of the exposed population compared to the risk in an unexposed (or differently exposed) population
remediation (option)	a way to clean-up, treat or otherwise manage contaminated soils
risk	a measure of the probability and severity of an adverse effect to health, property, or the environment
risk management	the use of risk estimates together with information about technical resources; social, economic, and political values; and control or response options, to determine which actions are the most appropriate for reducing or eliminating risks
setback distance	the distance that defines an area that restricts the land use to minimize the risk to the exposed population or potential damage from noise, vibration, or estimated risks along transportation routes
shunting operation	train movements from one track to another
slurry wall	a non-solid barrier (usually of bentonite) placed in the subsurface to confine the flow of water
SO_2	sulphur dioxide; an air pollutant usually associated with the combustion of fuel that contains sulphur
societal risk	sum of the risks experienced by individual members of a population

soil management strategy	a combination of remediation options intended to result in soil conditions that comply with environmental requirements
SPA Technical Committee	includes representatives from the City of Toronto, Metropolitan Toronto, the Metropolitan Toronto and Region Conservation Authority, the Ontario Ministry of Municipal Affairs, the Ontario Ministry of Natural Resources, and the Ontario Ministry of the Environment
special policy area (SPA)	a designation required under provincial flood plain policy before new development can occur or continue on a flood plain
spectral analysis	an analysis of a sound filtered over the octave bands from 63 to 8000 Hz; noise control solutions require analysis of sound from the noise source over the above frequency range
sphere of influence	an area around an odour source from which odour complaints can be expected to originate
spill zone	a flood prone area
STAMSON model	MOE model used to predict noise levels
storm water	runoff water produced by a storm
sub-area	one of three sections into which Ataratiri will be divided for the purposes of development phasing
switching movements	a switcher is a locomotive used to move individual railcars in a rail yard
TKN	total Kjeldahl nitrogen; a measurement of organic nitrogen including ammonia
TOC	Total Organic Carbon; a measurement of the organic constituents in water used as an indication of organic chemical contamination

tonal sound	a sound which has a pronounced buzz or whine
total hydrocarbons (THC)	all hydrocarbon species including methane
toxic index	measure of toxicity hazard associated with a system and material; used to assess the risk posed by a fixed facility, this value is calculated from information on the materials handled at the facility including the volume of the material and its volatility
transportation corridor	a linear area that contains facilities such as major roadways or railways
trigger level	a concentration of a chemical in soil that, if exceeded, indicates that further study is necessary; interim acceptable change in soil quality based on existing or assumed background levels
TSP	total suspended particulate matter; airborne particulate matter less than less than 44 μm in diameter
vibration velocity	the "velocity" (usually expressed in units of mm/s) experienced by a point on a vibrating surface
volatile organic compounds	compounds that evaporate readily at ambient temperatures and pressures, e.g., such as gasoline and solvents
water table	the static water level elevation in a geologic formation exposed to the atmosphere, such as surficial soils
Worst Case Model	numerical dispersion model developed by the MOE for estimating the maximum concentration arising from a source
Year 2010 AADT	the predicted Annual Average Daily Traffic in the Year 2010

SYMBOLS AND ABBREVIATIONS

AADT	annual average daily traffic
AAQC	ambient air quality criteria
ALRT	Advanced Light Rapid Transit
BLEVEs	boiling liquid expanding vapour explosions
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Clean Air Program
CCME	Canadian Council of Ministers of the Environment (formerly CCREM)
CCREM	Canadian Council of Resource and Environment Ministers
CDWQG	Canadian Drinking Water Quality Guidelines
CEPA	Canadian Environmental Protection Act
CMHC	Canada Mortgage and Housing Corporation
CNR	Canadian National Railway
CO	carbon monoxide
CO_2	carbon dioxide
C of A	Certificate of Approval
CPR	Canadian Pacific Railway
dBA	A-weighted decibels
DNAPL	dense non-aqueous phase liquid
DVP	Don Valley Parkway
EAA	Ontario Environmental Assessment Act

EC	electrical conductivity
EES	Environmental Evaluation Study
EPA	Ontario Environment Protection Act
GAS	MOE multisource gas model
Hz	hertz; a measurement of frequency equal to cycles per second
ICCC	Inter-ministry Committee on Cleanup Criteria
km	kilometre
L	litre
L(90)	the sound level exceeded 90% of the time
Leq	equivalent (or ambient) sound level
Leq(16)	averaged sound level over the 16-hour daytime period
Leq(8)	averaged sound level over the eight-hour nighttime period
LPG	liquefied propane gas
m^3	cubic metre
MAMU	mobile air monitoring unit
MCCR	Ontario Ministry of Consumer and Commercial Relations
MENVIQ	Ministère de l'Environnement du Québec
mm	millimetre
MMA	Ontario Ministry of Municipal Affairs
MNR	Ontario Ministry of Natural Resources
MOE	Ontario Ministry of the Environment

MOL	Ontario Ministry of Labour
MTRCA	Metropolitan Toronto and Region Conservation Authority
NAC	Neighbourhood Advisory Committee
NO	nitric oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
ODWQO	Ontario Drinking Water Quality Objectives
OWRA	Ontario Water Resources Act
PAHs	polynuclear or polycyclic aromatic hydrocarbons
PA system	public address system
Pb	lead
PCBs	polychlorinated biphenyls
PCDDs	polychlorinated dibenzo-p-dioxins
PCDFs	polychlorinated dibenzofurans
POI	point-of-impingement
PWQO	Provincial Water Quality Objective
RHC	reactive hydrocarbons
RWDI	Rowan Williams Davies & Irwin Inc.
SAR	sodium adsorption ratio
SO_2	sulphur dioxide

SPA	special policy area
STP	sewage treatment plant
t	tonne
TDM	Trow, Dames & Moore
TEF	toxicity equivalent factors
TEQ	toxic equivalent quantity
THC	total hydrocarbons
TOC	total organic carbon
TKN	total Kjeldahl nitrogen
TSP	total suspended particulate matter
VOCs	volatile organic compounds
WCM	MOE Worst Case Model
y, yr	year
μg	microgram

APPENDIX A ATARATIRI EXEMPTION ORDER

Schedule "C" to an Agreement made as of the 13th day of July, 1988 between Her Majesty the Queen in right of Ontario as represented by the Minister of Housing for the Province of Ontario and The Corporation of the City of Toronto.

Order Made Under the
Environmental Assessment Act

Exemption - The Corporation of the City of Toronto

Having received a request from The Corporation of the City of Toronto, that the undertaking, namely:

> the enterprise or activity of a building development involving mixed land uses with significant emphasis on affordable and non-profit housing in the area of the City of Toronto bounded on the west by the westerly limit of Parliament Street, on the north by the northerly limits of Front Street East, Eastern Avenue and the Eastern Avenue Diversion, the westerly limit of St. Lawrence Street and the northerly limit of King Street East, on the east by the easterly limit of Bayview Avenue, and bounded on the south as follows - starting at Parliament Street, east along the southerly limit of Mill Street, the westerly limit of Cherry Street and the northerly limit of the Toronto Terminals Railway Corridor, but excluding therefrom the Gooderham & Worts properties on the north side of Mill Street between Trinity Street and Cherry Street, and east along the Railway Corridor to the easterly limit of Bayview Avenue, together with lands south of the Railway Corridor known as Gordon Young/Maple Leaf Mills Ltd. being premises 554 Lake Shore Boulevard East, (the 'site'),

be exempt from the application of the Act pursuant to section 29; and

Having been advised that if the undertaking is subject to the application of the Act, the following injury, damage or interference with the persons and property indicated will occur:

A. The people of Toronto will be interfered with as a result of a delay in bringing onto the market much needed non-profit and affordable housing units during a time when waiting lists for public, non-profit and co-operative housing are large and growing rapidly.

B. Several locations within and off-the-site of the proposed undertaking will not promptly benefit from the removal of industrial emission sources and contaminated soils if the undertaking does not proceed.

Having weighed such injury damage or interference against the betterment of the people of the whole or any part of Ontario by the protection, conservation and wise management in Ontario of the environment which would result from the undertaking being subject to the application of the Act;

The undersigned is of the opinion that it is in the public interest to order and orders that the undertaking is exempt from the application of the Act for the following reasons:

A. The public will benefit by the exemption in that the undertaking will increase the housing supply in the City particularly through the provision of affordable housing, non-profit housing and housing for persons with special needs, at a time when the supply of all types of housing in the City and particularly within the core area of the City, is in great shortage, and waiting lists for public, non-profit and co-operative housing are growing rapidly.

B. The site provides a substantial amount of land that can be well integrated with the existing physical and social infrastructure of the city core. It is capable of being developed within a reasonable period of time.

C. Some locations within the site have undesirable environmental qualities because of soil contamination caused by previous and existing industrial land uses which will be remedied or controlled if the undertaking goes ahead.

D. The conditions of this order will ensure that there is a thorough environmental planning and approval process, involving opportunities for public participation at various stages.

E. The net effects on the environment of the undertaking, after the disruption of construction, should be minimal and be positive in nature, particularly considering the existing industrial-type uses in the area.

F. Environmental effects respecting the undertaking will be addressed in detail as set out in the conditions of this order.

G. A great proportion of the components of the undertaking are not subject to the requirements of the EA Act including the municipal non-profit housing component and ancillary commercial and other uses within the housing project.

This exemption is subject to the following terms and conditions:

1. This order only exempts the acquisition, development and use of the site for the proposed mixed residential, commercial, institutional, community parks, and industrial land uses.

2. (1) An environmental overview study:

   a) shall be undertaken by the proponent and submitted to the Minister of the Environment for approval following an opportunity for public notice, review and comment, before the Official Plan Amendment(s) for the undertaking is submitted to the Minister of Municipal Affairs for approval under the Planning Act,

   b) shall identify key environmental concerns on and off the site, including:

      i) any effects on health;

      ii) soil quality;

      iii) air quality, including odours and dust;

      iv) noise and vibration;

      v) water quality, including ground and storm water; and

      vi) the presence or absence of waste associated with the former coal gasification plant, and

c) shall contain:

- i) an overview of existing soil and ground water quality conditions and proposed soil and ground water management for the entire site;
- ii) a risk analysis of injury or damage from flooding or accidents upon road and rail corridors in the area of the site;
- iii) a description of the detailed environmental studies on impacts and mitigation measures and strategies that will be carried out for each part of the site prior to zoning by-law amendments or development agreements or agreements of purchase and sale being entered into by the City for the development or disposition of that part of the site;
- iv) a description of the environmental planning and approvals process under the Planning Act and other statutory authorities including the sequence of development from the Official Plan Amendment to zoning by-law amendments for each area of the site;
- v) a description of the agreements that will be entered into by the City for each part of the site; and
- vi) a summary of any submissions made or concerns raised by the public and the responses thereto.

2. (2) In these conditions "remedial work" means anything of an environmental nature required to be done by these conditions or the programs and strategies developed under them for the purpose of removing environmental risks from the site or rendering them unlikely to cause adverse effects.

3. The City shall develop detailed soil and ground water quality management programs for each area of the site which will be submitted to the Director of the Central Region, Ministry of the Environment for approval, prior to approval of zoning by-law amendments. The program shall examine if, how and where contaminated soil should be removed.

4. (1) On the basis of key concerns raised in the environmental overview study, including the soil and ground water quality aspects, the City shall undertake the detailed studies referenced in subsubsub-condition number 2(1)(c,(iii) on specific environmental problems to identify the extent of the problems and suggest remedial strategies. The studies shall identify which remedial measures can be carried out prior to commencement of construction and which can only be carried out or completed after construction has commenced on the parts of the site to which the remedial measures relate. The studies shall be submitted to the Director of the Central Region, Ministry of the Environment for approval, prior to approval of zoning by-law amendments.

(2) The remedial measures described in any study submitted under subcondition 4(1) as being able to be carried out prior to commencement of construction shall be so carried out.

5. The Official Plan Amendment for the undertaking shall provide that:

a) the environmental planning and approvals process under the Planning Act and other statutes, specified in the approved environmental overview study be followed,

b) the site be the subject of a holding symbol under section 35 of the Planning Act and that the symbol be removed with respect to any part of the site only when a consulting engineer has:

i) certified that remedial work required under any of these conditions to be carried out prior to commencement of construction on that part of the site has been properly completed;

ii) prepared a report setting out how the remedial work has been carried out and what if any other remedial work remains to be done and that the property is safe for the intended land use; and

iii) delivered a copy of the certificate and report to the Director of Central Region, Ministry of the Environment and the City Clerk,

c) whenever the City owns any residential premises on the site, or has control over them by agreement or otherwise for the purpose of this condition, it shall ensure that the premises are not leased to any person unless the prospective tenant has been advised of the nature of any ongoing environmental concerns relating to the premises and identified under these conditions, such as potential noise, vibration, dust or odour impacts on the premises,

d) environmental mitigation measures developed under conditions 2, 3 and 4 and any programs and strategies and other remedial works developed under them and the balance of the subconditions be carried out and complied with,

e) where the City sells any part of the site, other than by means of a plan of subdivision, rather than developing it and continuing to own it, the City, as vendor, will impose a building scheme in a registered agreement satisfactory to the Director, Central Region, of the Ministry of the Environment, so that it will run with the land and bind subsequent purchasers, requiring the environmental mitigation measures developed under conditions 2, 3 and 4 and any programs and strategies and other remedial works developed under them and the balance of the subconditions be carried out and complied with,

f) where any part of the site is to be developed as a condominium or by means of a plan of subdivision then in lieu of establishing the building scheme referred to in subcondition (e) there shall be an agreement under section 50 of the Planning Act, 1983 registered on title imposing similar conditions,

g) an environmental consultant be retained by the City to certify that all site plans and building plans comply with environmental requirements and incorporate all necessary environmental safeguards including provisions for noise, vibration, soil quality, ground water quality, storm water, air quality, odour and dust,

h) an on-site environmental inspector be retained by the City of Toronto to provide on-site environmental inspection and supervision of grading and construction activities to ensure that best available environmental practices are followed, including those for soil, air, noise and water management and, to ensure an acceptable clean-up of each area for the intended land use, who shall make a monthly status and compliance report to the Director, Central Region, of the Ministry of the Environment, and the City of Toronto, and

i) all contract documents regarding site grading and restoration, clean-up and construction work shall provide the on-site environmental inspector and environmental consultant(s) with authority over on-site construction activities to ensure compliance with any environmental conditions in, or developed under, these conditions that relate to the contract.

6. In carrying out the above conditions, the City shall ensure that full public participation in the planning process is encouraged and provided for and that the studies referred to in condition number 4 are reviewed at a meeting at which the public may make representations to City Council or one of its committees prior to being submitted to the Minister of the Environment for approval.

7. The proponent shall at least annually report in writing to the Director of the Environmental Assessment Branch of the Ministry of the Environment for filing with the public records kept under section 31 of the Environmental Assessment Act. The reports shall set out the progress with the implementation of the undertaking and compliance with conditions contained in this document and with the environmental aspects of agreements entered into pursuant to these conditions.

8. Any agreement which is entered into under the Housing Development Act or the Planning Act, 1983, and any building scheme agreement and agreement of purchase and sale entered into by the City for the development and/or disposition of any part of the site shall require compliance with these conditions and the programs and strategies developed under them, in so far as they relate to the lands dealt with by the agreements.

9. Where any activity which otherwise would be exempt under this order, is being carried out as or is part of, an undertaking for which an environmental assessment has been accepted and approval to proceed received, the activity shall be carried out in accordance with any terms or conditions in the approval to proceed as well as the conditions of this order.

10. Where any activity which is the subject of this order, is being carried out as or is part of, another undertaking which is the subject of an exemption order under the Act, the activity exempt under this order shall be carried out in accordance with any terms or conditions in the other exemption order as well as the conditions in this order.

11. This exemption shall expire on July 1, 1990, unless the proponent has filed a report with the Director under condition 7 indicating that the undertaking has commenced.

APPENDIX B SUMMARY OF PUBLIC SUBMISSIONS AND RESPONSES

NAC Meeting held on 1 June 1989

Question: Will the evaluation of soil quality include acceptable levels for growing food?

Answer: Yes.

Question: To what extent are the developers prepared to go to make the site appropriate?

Answer: The city will make the decision. The Environmental Subcommittee's position is not to go ahead if it cannot be made safe.

Question: Will the Keating Channel be dredged continually?

Answer: Full dredging is needed in perpetuity to maintain the recommended level of protection. (This issue is discussed more fully in Chapter 6 of this report.)

Question: What are the reference points for determining acceptable air quality?

Answer: There are no Ataratiri-specific reference points. Air quality must meet all the criteria and guidelines established by the MOE based on research on safe levels for various pollutants.

Question: Will the demolition of the tank farms in the port have any impact on soil and water quality at Ataratiri?

Answer: No, each demolition process is required to measure its own level of contamination and clean it up to an acceptable level according to its intended future use.

Question: Are there long-term human health effects of some of the heavy metals found in the soil?

Answer: Where human health concerns are pre-eminent, soil guidelines have been set at levels that should avoid adverse health effects.

Question: Are these guidelines available?

Answer: Yes, see the MOE report *Guidelines for the Decommissioning of Industrial Sites in Ontario.*

Other verbal comments that were received at the 1 June meeting after the formal portion concluded were as follows:

Comment: This area should never have been developed; it should have been left in its original state as a marshland.

Response: The issue of "marshland" lies outside of the scope of the present study since it refers to historical development. However, we are hoping to return the edge of the Don River to a more natural state.

Comment: The cleanup and development sound expensive; can we really afford to do everything that needs to be done?

Comment: Now that we know the contamination is there, we can't just leave it.

Response to the preceding two comments: Funds will be made available to make the site acceptable for redevelopment.

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